Increasing Parental Physical Activity via Children's Advocacy:

The 'Walk your Dad' Study

by

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DECLARATION

a) Except where due acknowledgement has been made, the work is that of the candidate alone;

b) The work has not been submitted previously, in whole or in part, to qualify for any other academic award;

c) The content of the thesis is the result of work carried out since the official commencement date of the approved research program;

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Julie Anthony

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ABSTRACT

Regular participation in physical activity has been associated with important health benefits, including a reduced risk of overweight/obesity, some cancers, type-2 diabetes and cardiovascular disease. Physical activity levels in Australian children have been increasing recently, although many children remain inactive and this is contributing to an increase in overweight and obesity. It is known that physical activity participation declines with age, with a large proportion of middle-aged males insufficiently active to meet Australian recommendations for health benefits.

The purpose of this study was to determine the effect of a child-focused, school-delivered physical activity program on daily steps of children and their paternal parent, and to evaluate the acceptability to teachers of the 'Walk your Dad' program.

A pre-test, post-test experimental/control groups design was used. The sample, recruited from Eltham College of Education, consisted of 60 children aged 10- to 13-years and 48 paternal parents aged 35- to 64-years. Physical activity levels were assessed over a 6-day period using New Lifestyles pedometers, 1-week prior to and 1-week after the intervention. The 12-week intervention consisted of two cross curriculum homework activities per week delivered to children by their classroom teacher, focusing on increasing physical activity behaviours of children and their paternal parent. Following cleaning and imputation, data were analysed using descriptive statistics and repeated measures ANOVA. Teachers (n=2) of intervention group participants independently completed a survey on the acceptability of the program in the week following its completion.

Mean weekend steps for children in the intervention group increased from 15,436 +/- 7,680 at pre-test to 19,575 +/- 10,537 at post-test, while among control group children steps decreased from 17,981 +/- 6,552 to 17,278 +/- 6,769. On weekdays (4-days), mean

steps for children in the intervention group increased from 46,090 +/- 16,001 to 48,760 +/- 13,648, while among control group children, steps decreased from 46,907 +/- 9,912 to 43,717 +/- 10,255. Mean weekend steps for paternal parents in the intervention group increased from 15,116 +/- 5,640 to 17,473 +/- 6,836, while among control group paternal parents steps decreased from 18,239 +/- 8,345 to 17,836 +/- 6,855. On weekdays (four days) mean steps for paternal parents in the intervention group increased from 31,141 +/- 13,246 to 31,507 +/- 13,132 while among control group paternal parents steps decreased from 34,942 +/- 11,109 to 32,502 +/- 12,602. Repeated measures ANOVA analyses revealed that on weekends for children there were significant differences between pre- and post-test ($p < .000$), between pre- and post-test for boys and girls ($p < .000$), and between boys, girls, intervention and control class ($p = .01$) at post-test. On weekdays for children there was a significant difference between intervention and control class at post-test ($p = .01$). Results for paternal parents indicated that there was a significant difference on weekends between pre- and post-test ($p < .000$) and on weekdays there was a significant difference between intervention and control class at post-test ($p = .05$). Both intervention class teachers had consistent views about the program.

The findings suggest that during the period of research and among this group, the intervention had a positive effect on weekend step behaviour of girls and weekday step behaviour of girls, boys and their paternal parents. The process evaluation revealed some aspects of the program may require modification.

CHAPTER I

INTRODUCTION

The importance of participating in physical activity for health benefits has been well established. A reduction in the risk of lifestyle diseases such as cardiovascular disease, some cancers and diabetes in adults (U.S. Department of Health and Human Services, 1996), as well as risk factors for heart disease and decreased adiposity in children (Trost, 2005) have been demonstrated.

Physical inactivity has long been identified as a serious problem and a major public health concern (Dobbins, Lockett, Michel, Beyers, Feldman,Vohra, et al., 2001). Despite this concern physical activity rates among adult Australians are declining and inactivity levels are rising (Bauman, Ford & Armstrong, 2001). The largest declines in physical activity are seen in young and middle-aged adults (Bauman, Ford & Armstrong, 2001), with approximately a quarter of males in the 45- to 54-years age group failing to participate in sufficient levels of physical activity for health benefits in 2006 (Department of Human Services (DHS), 2007). In contrast, some evidence suggests participation in physical activity by children in Australia has been increasing in the recent past (Booth, Okely, Denney-Wilson, Hardy, Yang & Dobbins, 2006), with 74% of boys and 60% of girls aged 9 to 13-years participating in the recommended amount of physical activity in 2007 (Department of Health and Ageing, 2007). However, evidence suggests many children remain inactive and activity levels still decline with increasing age (Telford, 2004).

The majority of evidence indicates the prevalence of obesity is rising among both adults and children, with a lack of physical activity cited as a major contributing factor (DHS, 2007; Roberts & Barnard, 2005). In 2005, almost 50% of Victorian adults were overweight or obese and current findings on obesity in Australian children have shown

that almost a quarter of boys and girls aged 5 to 16-years are overweight or obese (Booth et al., 2006). This is of particular concern as obesity is a significant risk factor for cardiovascular disease (Access Economics, 2005) and is associated with Type-2 diabetes and stroke (Wellman & Friedberg, 2002).

Increasing the physical activity levels of adults and children is an important approach to improve health and decrease the risk of developing lifestyle diseases. Middle-aged males can reduce their risk of mortality by participating in moderate- to vigorous-intensity physical activity (Blair, Kohl, Barlow, Paffenbarger, Gibbons & Macera, 1995), such as walking (Bassuk & Manson, 2005). Childhood is an important time to develop positive physical activity behaviours as inactivity has been shown to track into adulthood (Raitakari, Porkka, Taimela, Telama, Rasanen and Viikari, 1994; Dobbins et al., 2001).

Numerous programs have been implemented within the school and community setting designed to increase physical activity and to improve health. The school environment is ideal for reaching large numbers of children (Dobbins et al., 2001) and there is strong evidence that family members have an influence on children's health behaviours (Nader, Sellers, Johnson, Perry, Stone, Cook, Bebchuk, & Luepker, 1996). School-based interventions have demonstrated significant increases in physical activity levels among children, although it is unclear of the length of time needed to show an intervention effect (Dobbins et al., 2001).

Aim

The 'Walk your Dad' program aimed to support children and their paternal parent to become more physically active. This program utilised the ability of children to communicate their knowledge of the importance of physical activity to their parents to help them develop healthy physical activity habits. The ability of children to positively

impact on parental knowledge and behaviour has been shown in recent studies including the SunSmart related 'Kidskin Sun Safety Education Program' aimed at encouraging children to educate their parents on SunSmart issues (Milne, English, Johnston, Cross, Borland, Costa, et al., 2000), a waste recycling program 'Waste Wise' (Sharpley, 2002) and an animal welfare program 'Caring for Farm Animals' (Connor, Hay & Coleman, 2006). In each of these programs information targeted at children were in turn successfully transferred to parents.

The objectives of this program were to improve the physical activity behaviours of both children and their paternal parent by providing the participants with the opportunity to increase their physical activity levels over a 12-week period. The 'Walk your Dad' program is a pilot study which aims to establish whether children can influence their paternal parent's physical activity behaviours and to evaluate the acceptability of the program to classroom teachers.

Research Questions

1. Can children be educated through a school-based cross-curricular intervention to increase paternal physical activity behaviour?
2. Is the physical activity behaviour of children altered after undertaking a school-based cross-curricular intervention designed to increase their paternal parents' physical activity behaviours?
3. Is the design of the 'Walk your Dad' program acceptable to classroom teachers?

Significance of the study

There is a great potential for family-based physical activity interventions due to the strong associations that exist between parent and child physical activity (Taylor, Baranowski & Sallis, 2004). However, most studies on the health and fitness of families have looked at the influence adults have on the physical activity levels of their children.

What hasn't been well researched is the idea that children can have an influence over their parent's physical activity behaviours. This study aimed to determine whether a child-focussed intervention implemented in a school setting could influence both child and paternal parental physical activity.

If children can be shown to be able to increase their own physical activity and that of their father, this program could be implemented on a larger scale to further investigate the influence children have over parental physical activity and also will contribute to the body of knowledge regarding using pedometers as an intervention tool.

Assumptions of the study

The study was based on the following assumptions:

- It was assumed that the teachers would allocate the time in the curriculum they had agreed to and deliver the program and collect and reflect on each homework activity.
- It was assumed that the teachers would be enthusiastic about being a part of the program and deliver it to children with enthusiasm and encouragement.
- It was assumed that families in the Eltham area were middle-class and moderately active with access to parks and walking tracks.
- It was assumed that fathers are typically more involved in physical/outdoor play interactions with their children throughout middle childhood (ages 5 to 12-years) than mothers (Bornstein, 2002).

Delimitations of the study

The following were delimitations of the study:

- The size of the study population was relatively small as it was restricted to one school; located in the Northern suburbs of Melbourne, Australia, and all participants were of middle-class socioeconomic status.

- Data from children who did not have a paternal parent at home to participate in the study were excluded from the analysis.
- The school term was 10-weeks long. Given the length of the intervention was 12-weeks, it was unable to fit wholly within one term and had to be split over a three week holiday break.
- The intervention group comprised two grade 5/6 classes, and the control group comprised one grade 5/6 class. This allocation system resulted in greater numbers of children and parents in the intervention group. The intervention group classes were assigned not randomised.

Limitations of the study

The following were limitations of the study:

- During testing the researchers had no control over whether children and parents wore the pedometers correctly, or at all, and therefore ensuring compliance with objective measures was difficult.
- Return of pedometers after testing was not always successful and some data was lost due to late return or misplaced pedometers.
- The pedometer is unable to record all physical activities, including water-based activities, or the intensity of activity.
- Reflection on homework tasks each week required the teachers to spend time on the program during class and this proved difficult for the intervention group teachers due to their ongoing work responsibilities.

Definition of Terms

1. Middle-aged – Adults aged 40 to 49-years.
2. Cross-curricular – Across different areas of a school curriculum, for example, Mathematics, Geography, Physical Education and English.

CHAPTER II

LITERATURE REVIEW

Introduction

A significant body of evidence exists in relation to the health benefits of physical activity. With this knowledge many intervention programs have been developed with the aim of increasing physical activity behaviours to improve health. The purpose of this chapter is to review relevant literature in relation to both adult and child physical activity and health, with a particular focus on middle-aged males. The effectiveness of pedometers as both a measurement and intervention tool are examined along with the design and effectiveness of school-based intervention programs aimed at increasing physical activity. Current recommendations for the level of physical activity needed for health benefits and epidemiological evidence on the participation levels of adults and children will also be addressed in this chapter.

Physical activity and adult health

This section overviews the literature regarding both the physical and psychological health benefits of physical activity in adults. The section consists of an overview of lifestyle diseases associated with physical activity, in particular cardiovascular disease, overweight and obesity, type-2 diabetes and certain types of cancer, as well as associated psychological benefits. The role of physical activity in the health of males, and middle-aged males in particular, is discussed. The benefits of walking as a physical activity and the population health burden attributed to physical inactivity are also summarised.

Physical activity is an important factor in the promotion of health and prevention of lifestyle-related diseases. Physical activity benefits people of all ages (U.S. Department of Health and Human Services, 1996), with participation in moderate- to vigorous-intensity physical activity associated with lower morbidity and mortality rates (Blair et.,

1995; Schnohr, Scharling & Jensen, 2003), reduced risk of cardiovascular disease (CVD), type-2 diabetes, hypertension and some cancers, as well as improvements in the health and function of muscles, bones and joints (U.S. Department of Health and Human Services, 1996).

Recent reviews have reported that physical inactivity is a modifiable risk factor for chronic diseases including obesity, osteoporosis, osteoarthritis (Warburton, Nicol & Bredin, 2006), diabetes, cancer, hypertension (Roberts & Barnard, 2005; Warburton, Nicol & Bredin, 2006), atherosclerosis and coronary artery disease (CAD) (Roberts & Barnard 2005). High levels of leisure-time physical activity can increase cardiovascular fitness (Talbot, Metter & Fleg, 2000), which has been shown to reduce the risk factors for coronary heart disease (CHD). Suzuki, Yamada, Suguira, Kawakami and Shimizu (1998) conducted a study on cardiovascular fitness and physical activity levels in Japanese men and women and their association with CHD. The findings showed that both cardiovascular fitness and physical activity reduced risk factors for CHD, but fitness was more closely associated with a reduction in risk factors including body mass index (BMI), body fat percent, heart rate (HR), blood pressure, lipid and lipoprotein levels. In conclusion, physically fit individuals had a better CHD risk profile than less physically fit individuals.

Individuals with a high level of Plasma C-reactive protein (an inflammatory marker) have a higher risk of CVD (Pearson, Mensah, Alexander, Anderson, Cannon & Criqui et al., 2003). Lakka, Lakka, Raniken, Leon, Rao and Skinner et al. (2005) studied the effects of exercise training on the levels of Plasma C-reactive protein. Their findings showed that after 20-weeks of activity, sedentary healthy adults showed an average 1.3mg/litre reduction in the Plasma C-reactive protein, which can significantly decrease the risk of cardiovascular disease. Also linked with an increased risk of CVD is

metabolic syndrome, a cluster of abdominal obesity, dyslipidaemia, hyperglycaemia and hypertension (Zimmet, George, Alberti & Shaw, 2005). Bertrais, Beyeme-Ondoua, Czerinichow, Galan, Hercberg and Oppert (2005) conducted a study on the effect of physical activity and sedentary behaviours on metabolic syndrome in men and women. They found that individuals who met the guidelines for vigorous-intensity activity had a two-thirds decrease in the likelihood of developing metabolic syndrome. Those who met moderate-intensity activity guidelines were also less likely to have metabolic syndrome. With increasing levels of leisure time physical activity the frequency of most components of metabolic syndrome decreased.

Various studies have shown that involvement in physical activity leads to important improvements in aspects of cardiovascular health. Results of a study on middle-aged males and females showed that after a 12-week training program during which participants were required to walk for 30-minutes, 3-times per week at 60% of their maximum oxygen uptake (VO_2max), significant gains in VO_2max and significant reductions in mean submaximal training heart rates occurred (Jette, Sidney & Campbell, 1988). In a study on the effects of a 10-week aerobic and anaerobic exercise program on healthy young males with average fitness levels, improved endothelial-dependant dilation in the arteries was found, which may contribute to the prevention of CVD. The exercise program consisted of daily 3-mile runs, endurance and strength exercises (Clarkson, Montgomery, Mullen, Donal, Powe & Bull et al., 1999).

Low levels of physical activity have been associated with obesity and other health problems (Department of Health and Ageing, 1999). A Victorian survey reported that in 2006 almost half of all adults were overweight or obese, with approximately 56% of males in this category (DHS, 2007). Males in the 45 to 54-year and 55 to 64-year age ranges had the highest levels of overweight/obesity out of all age groups and both

genders. Among males aged 35 to 64-years, over 60% are deemed overweight or obese based on BMI scores (DHS, 2007). People most likely to be categorised as being overweight or obese were those that (among others) reported not participating in 30-minutes per week of vigorous physical activity and those spending less than 150-minutes walking in the previous week (DHS, 2007). Overweight and obesity has been linked to physical inactivity, as well as several lifestyle related diseases, such as type-2 diabetes and CVD (Wellman & Friedberg, 2002).

Compared with sedentary individuals, physically active men and women have a much lower incidence of type-2 diabetes (Bassuk & Manson, 2005). The Framingham Heart Study showed that both moderately- and highly-active individuals lived longer and did not develop type-2 diabetes as early or as often as low-active individuals. At age 50-years, moderately-active and highly-active individuals lived without diabetes for 2.3- and at least 4-years longer respectively than their low-active counterparts (Jonker, De Laet, Franco, Peeters, Mackanbach & Nesselder et al., 2006). Similarly, in a study of middle-aged overweight men and women the risk of developing diabetes was reduced by 58% after making lifestyle changes including increasing levels of physical activity (Tuomilehto, Lindstrom, Eriksson, Valle, Hamalainen, Ilanne-Parikka, et al., 2001). Another study by Pan, Li, Hu, Wang, An and Hu et al. (1997) found that over a 6-year period the incidence of men and women with impaired glucose tolerance developing type-2 diabetes was reduced by 47% after participating in an exercise-only intervention.

Current evidence shows that physical activity is associated with a reduced risk of the development of specific forms of cancer. A review of the literature by Hardman (2001) found that there is a strong relationship between both occupational and leisure-time physical activity and a reduction in the risk of colon cancer and breast cancer. A review by Friedenreich (2001) found that 32 studies demonstrated a significant reduction

in the risk of colon and colorectal cancer in physically active men and women, with an average risk reduction of 40-50%. According to Lee (2003), at least 30-minutes of moderate-intensity physical activity 5-days/week is needed to reduce the risk of developing colon cancer.

Fit men have lower death rates from CVD, as with all-cause mortality, than unfit men. Low physical fitness is associated with increased risk of CHD and CVD (Blair et al., 1995). Improving or maintaining physical fitness can reduce mortality risk in men, with middle-aged men who begin to participate in moderate- to vigorous-intensity physical activity demonstrating a lower risk of dying than men who remain sedentary. Blair et al. (1995) demonstrated that, throughout 18-years of follow-up, persistently unfit men had the highest death rates, men who were fit at both examinations had the lowest death rates and men who were initially unfit and became fit had a 44% lower risk of all-cause mortality and a 52% lower age-adjusted risk of CVD mortality than those who were unfit at both assessment points. Persistently fit men had the lowest risk of CVD mortality. Middle-aged males who increased their fitness had 3% lower deaths rates than those who remained unfit.

Results of a study by Myers, Kaykha, George, Abella, Zaheer and Lear, et al. (2004) on exercise capacity and its relation to mortality in middle-aged men showed that participants with a higher exercise capacity and activity levels had better survival rates and lower mortality. Participants who were fit or active over approximately 5-years in this study had more than a 50% reduction in mortality risk, regardless of their fitness or activity level at the beginning of the study. Among the least fit participants, an increase in activity to 'relatively' active was associated with a 68% reduction in mortality and among the least active participants (sedentary) an increase in fitness to relatively fit was associated with a 55% reduction in mortality.

Cardiorespiratory fitness can be associated with a lower risk of disability in men due to CVD. Karpansalo, Lakka, Manninen, Kauhanen, Rauramaa, and Salonen (2003) studied the fitness levels of middle-aged men over an 11-year period and found that physical fitness was inversely associated with the likelihood of accessing a disability pension. Men with a lower VO_2max and shorter duration of exercise test had a high association with the risk of disability due to CVD and musculoskeletal disorders.

Low cardiorespiratory fitness and physical inactivity are associated with higher mortality in middle-aged men who have type-2 diabetes. In a study by Wei, Gibbons, Kambert, Nichaman and Blair (2000), during an average follow up of 12-years, unfit men with type-2 diabetes were more likely to have CVD and high levels of fasting plasma glucose, total cholesterol, uric acid, triglycerides and high blood pressure. There was a high association between low fitness and mortality with an excess number of deaths from CVD, cancer and diabetes. Church, Cheng, Earnest, Barlow, Gibbons and Priest et al. (2004) found that among middle-aged men with type-2 diabetes there was a strong association between fitness and mortality across all BMI and body fatness class. Tanacescu, Leitzmann, Rimm and Hu (2003) found that men with type-2 diabetes who were physically active had a lower risk of CVD.

In a study on the effects of regular participation in aerobic exercise on middle-aged males, Stein and Boutcher (1992) found that following an 8-week intervention consisting of 24 supervised exercise sessions there was a significant effect on reducing absolute and pre-test-adjusted heart rate responses to both physiological and psychological stressors. This lowered cardiovascular reactivity, which can help to decrease the risk of atherosclerosis.

Walking has been shown to be an effective form of activity for reducing CVD risk factors (Bassuk & Manson, 2005). A meta-analysis by Richardson, Newton, Abraham,

Sen, Jimbo & Swartz (2008) found that overweight or obese sedentary adults who participated in pedometer-based walking interventions increased their number of steps per day, which was in-turn associated with a modest weight loss. In a review of interventions of at least 4-weeks duration in which increased walking was the only change, Kelley, Kelley and Tran (2001) concluded that walking reduces resting systolic and diastolic blood pressure in adults and also increases maximum oxygen consumption and decreases resting heart rate. Bravata, Smith-Spangler, Sundaram, Gienger, Lin, Lewis, et al. (2007) reviewed 26 studies with an average intervention duration of 18-weeks using pedometers to increase walking. The intervention group participants showed significant decreases in both systolic and diastolic blood pressure as well as a significant decrease in BMI. Frank, Andresen, and Schmid (2004) found in a study of physical activity and obesity in adults, distance walked resulted in a reduction in the odds of being obese. In a sample of adults with diabetes mortality rates were lowest in those who participated in walking. When compared with inactive individuals, participants who walked at least 2-hours per week had a 39% lower all-cause mortality rate and a 34% lower cardiovascular disease mortality rate. Mortality rates were lowest for those who walked over 3-hours per week and in those who reported moderate-intensity walking activity (Gregg, Gerzoff, Caspersen, Williamson & Narayan, 2003). Studies on men have shown that walking is associated with a reduction in the incidence of CVD (Bassuk & Manson, 2005). Tanacescu et al. (2003) found that walking was associated with lower CVD risk in men with type-2 diabetes and walking pace was a strong predictor of total and fatal CVD. Overall walking volume was associated with reduced mortality.

Insufficient physical activity has been linked to risk factors for CVD, including stroke, overweight and obesity, high blood pressure and high cholesterol (Access Economics, 2005). Overall, physical inactivity was responsible for about 7% of the

burden of disease in Australia in 1996 (Mathers, Vos, Stevenson, Begg, 2000). Physical activity has an important role in reducing the risk of chronic disease among Australians (Armstrong, Bauman & Davies, 2000), with even the most inactive or sedentary people able to gain health benefits if they become slightly more active (Department of Health and Ageing, 1999).

Numerous studies have examined the effects of physical inactivity on the health of individuals and the community. The Victorian Burden of Disease Study on morbidity lists lifestyle factors, including physical inactivity, as being responsible for a sizeable proportion of the total burden of disease, with physical inactivity responsible for 4% of the total disease burden in Victoria and considered one of the most important risk factors for disease and injury in 2001 (DHS, 2005). The overall size of the Victorian burden of disease in adults aged 35 to 64-years in 2001 was 20% more in men than in women, with men displaying up to twice the burden attributable to cardiovascular diseases than women (DHS, 2005).

Physical activity can also have positive effects on psychosocial health. Regular physical activity is important for the prevention of mental health conditions (Armstrong, Bauman & Davies, 2000) and has been associated with psychological benefits for adults (Kiernan, King, Stefanik & Killen, 2001; Hassmen, Koivula &Uutela, 2000), including a decrease in anxiety (Goodwin, 2003), depression (Goodwin, 2003; Hassmen, Koivula &Uutela, 2000), anger, cynical distrust and stress (Hassmen, Koivula &Uutela, 2000). Regular participation in physical activity can also benefit social integration and an individual's perceptions of their own health and fitness (Hassmen et al., 2000).

A study by De Moor, Beem, Stubbe, Boomsma & De Geus (2006) examined physical activity and its association with anxiety and depression in over 19,000 people. Participants were twins with a mean age of 33-years and were deemed exercisers if they

exercised for at least 60-minutes per week. Results showed that participants who exercised were consistently less anxious, depressed and neurotic than non-exercisers. Similarly, a review by Salmon (2001) associated high levels of self-reported habitual physical activity with better mental health and lower levels of depression. Another review reported that even a single exercise session can have acute benefits on mood (Yeung, 1996).

In summary, physical inactivity has been linked to numerous health conditions including overweight and obesity and type-2 diabetes which are in turn risk factors for CVD. Participating in moderate- to vigorous-intensity physical activity can reduce the risk of morbidity and mortality from lifestyle diseases in both men and women, with middle-aged males able to achieve health benefits even if beginning a physical activity program at their age. Notably, walking has been shown to reduce the incidence of CVD among men, which is important because it is an easy, safe and low cost option for physical activity (Gessell, 2004).

Physical activity and child health

This section overviews the literature regarding both the physical and psychological health benefits of physical activity for children. The section consists of a review of the relationship between physical activity and CVD risk factors, as well as psychological benefits. This is followed by a review of the success of school-based interventions aimed at decreasing risk factors for CVD. However, it is important to note that while many studies have been conducted on the relationship between physical activity and health benefits among adult populations, it is more difficult to detect similar relationships among children because lifestyle-related diseases don't normally manifest until adulthood (Trost, 2005).

Health benefits of physical activity for children include reduced adiposity and risk of osteoporosis (Trost, 2005) and positive effects on blood pressure, cholesterol, insulin concentrations (Booth et al., 2006) and insulin sensitivity (Schmitz, Jacobs, Hong, Steinberger, Moran & Sinaiko, 2002) all which are risk factors for CVD (Booth et al., 2006). A significant correlation between physical activity and lower fasting insulin has been seen in children and adolescents aged 10 to 16-years with above average systolic blood pressure or percentage body fat, therefore reducing the risk of type-2 diabetes (Schmitz et al., 2002). A strong association with CHD risk factors and habitual physical activity has been seen in children and adolescents aged 9 to 18-years (Katzmarzyk, Malina & Bouchard, 1999) and younger children aged 5 to 10-years (Abbott, Harkness & Davies, 2002). Physical fitness also has a strong relationship with CHD risk factors in children (Katzmarzyk, Malina & Bouchard, 1999). Moderate- and vigorous-intensity physical activity levels are a strong predictor of physical fitness in children aged 8 to 10-years and have a negative association with body fat (Rowlands, Eston, & Ingledew, 1999).

A study by al-Hazzaa, Sulaiman, al-Matar and al-Mobaireek (1994) examined the relationship between daily physical activity, cardiorespiratory fitness (defined as VO2max) and coronary artery disease risk factors in preadolescent boys. Results showed a significant difference between body fat percentiles across fitness categories, with lower body fat associated with higher levels of cardiorespiratory fitness. Boys demonstrating higher levels of physical activity had higher HDL-cholesterol and lower triglycerides levels as well as lower blood pressure. However, it should be noted that there were no significant differences in other risk factors such as fasting blood glucose and total cholesterol. Similarly, another study looked at aerobic fitness (defined as VO2max) and its link to positive health outcomes in children. According to the author it is very

difficult to link such outcomes as coronary artery disease and the complications of obesity to aerobic fitness, as they don't appear until later in life. However, the evidence does indicate that aerobic fitness has a positive effect on body fat content (Rowland, 2007).

Childhood obesity is a significant health problem in Australia. Data from the 2007 Children's Nutrition and Physical Activity Survey showed that 17% of children aged 2 to 16-years were classified as overweight and 6% were obese (Department of Health and Ageing, 2007). A study by Trost, Kerr, Ward and Pate (2001) showed that children in sixth grade who are obese participate in significantly less 5 to 20-minute bouts of exercise than non-obese children. In a review of 56 studies relating childhood physical activity to overweight or obesity, Trost (2005) reported that a majority of the studies observed a significant inverse association between physical activity and body composition or obesity/overweight status. Maziekas, LeMura, Stoddard, Kaercher & Martucci (2003) completed another analysis of eight studies on exercise as a method of treating obesity in children aged 4 to 17-years. The authors concluded that significant decreases in percentage body fat were seen immediately following intervention programs, compared to control group and pre-test values. After one year of follow up, the lower percentage body fat was maintained.

Studies have also reported a positive association between physical activity and psychological factors in children including stress levels, anxiety, self-concept and self-esteem (Trost, 2005). Physical activity can provide a positive environment to teach beneficial values and avoid negative health behaviours such as smoking, alcohol and drug abuse (Trost, 2005). Overweight and obesity has been linked with psychological distress and poor social well-being in children (Booth et al., 2006).

A study that assessed the responses to physical exercise in children found that an increase in positive mood and decrease in negative mood was reported following a 15-minute bout of aerobic exercise (Williamson, Dewey & Steinberg, 2001). In a study on psychosocial correlates of physical activity children aged 10 to 16-years of age showed increased self-efficacy and social influences with high daily levels of physical activity (Strauss, Rodzilsky, Burack & Colin, 2001).

In a study by Kirkcaldy, Shephard & Siefen (2002) the effects of participation in endurance sport on self-image and psychological health were examined. German high school students aged 14 to 18-years completed questionnaires aimed at assessing anxiety-depression, trait addiction, smoking and drinking behaviour and self-perception of self-image. Involvement in endurance sport was assessed by questionnaire and was rated according to the degree of regular, continuous involvement in general recreation activities. The results showed a significant association between regular participation and a favourable self-image, a personality that is resistant to addictions, psychological well-being and the adoption of a healthy lifestyle. Those participating regularly also displayed much lower anxiety-depression scores and less social behaviour inhibitions.

Similarly, a study by Aarnio, Winter, Kujala & Kaprio (2002) demonstrated that physical inactivity was associated with a less healthy lifestyle, poor educational progression and poor self perceived health. The study consisted of over 5,000 twins aged 16-years who completed questionnaires on leisure time physical activity, other health related behaviour, social relationships and health status. Those exercising four to five times per week were considered persistent exercisers and those participating two or less times per month were considered persistently inactive. In both sexes, smoking, irregular breakfast eating, attending vocational school and poor self perceived current health were significantly associated with persistent inactivity.

School-based interventions have shown positive results for improving the health of children through physical activity. Planet Health was a school-based intervention aimed at decreasing obesity among boys and girls in grades six to eight. Classroom teachers were used to teach the lessons which were implemented into four subject areas as well as Physical Education (PE). The sessions focused on improving dietary behaviour, increasing physical activity and decreasing television viewing. Female students showed a decrease in obesity after the 2-year intervention (Gortmaker, Peterson, Wiecha, Sobol, Dixit, Fox, et al., 1999b).

The aims of the 'Know Your Body' program were to decrease the risk factors of CHD in children. Regular classroom teachers were trained to deliver the curriculum. The intervention was implemented over 5-years and the program contained a parent education component. Newsletters, surveys and family exercise days were also incorporated into the program. Results of the program showed significant positive effects on total cholesterol and systolic blood pressure in children in the longitudinal cohort at 3-year post-test (Resincow, Cohn, Reinhardt, Cross, Futterman & Kirschner et al., 1992).

A review of school-based interventions by Harrell, Gansky, McMurray, Bangdiwala and Bradley (1998) demonstrated that both a risk-based and a population-based environment intervention improved the CVD risk profile of children with multiple risk factors. Physical activity in both groups was found to be significantly higher than the control group, with decreases found for cholesterol levels and skinfold thickness (Harrell, McMurray, Gansky, Bangdiwala & Bradley, 1999).

In summary, children can gain significant physical and psychological health benefits from participating in physical activity. Risk factors for cardiovascular disease, including overweight and obesity have been reported in children who are insufficiently active. Physical activity is particularly important in childhood as physical activity

behaviours and obesity appear to track into adulthood (Taylor, Baranowski & Sallis, 2004), and therefore these children are at higher risk of morbidity and mortality from lifestyle diseases when they become adults.

Physical activity guidelines

The importance of participation in physical activity for health has led to the development of physical activity guidelines. Various guidelines exist among developed nations, some for general health and some for specific populations and health conditions. This section explains the guidelines for adults in Australia and other developed countries, as well as examples of specific guidelines aimed at children, older Australians and people with illness.

Multiple physical activity recommendations exist so that they can be applied to meet the needs of specific individuals. The President's Council on Physical Fitness and Sports (2002a) lists examples of the types of groups that guidelines may be written about and these include, children, adolescents, adults, older adults, people with illness, including heart disease, diabetes and other populations, such as the people with a disability. The guidelines are designed to achieve specific health benefits, which can include fitness, illness prevention, wellness promotion and weight control (President's Council on Physical Fitness and Sports 2002a)

In Australia, the National Physical Activity Guidelines outline the minimum levels of physical activity required to enhance the health of adults. The guidelines recommend that people should:

- think of movement as an opportunity, not an inconvenience
- be active every day in as many ways as you can
- put together at least 30-minutes of moderate-intensity physical activity on most, preferably all days

- if you can, also enjoy some regular, vigorous activity for extra health and fitness.

(Department of Health and Aged Care, 1999).

Similarly, recommendations for Americans encourage adults to engage in:

- moderate-intensity physical activities for at least 30 minutes on five or more days of the week, or
- vigorous-intensity physical activity three or more days per week for 20 minutes or more per occasion.

(U.S. Department of Health and Human Services, 2006a).

The physical activity guidelines for New Zealand adults have been in place since 1996 and include:

- at least 30 minutes per day, five days per week.

(SPARC, 2007).

In the past, recommendations for children's physical activity have generally been similar to those for adults (Trost, 2005). Recognising a need for separate guidelines, the Australian Government has developed the following physical activity recommendations for children aged 5 to 12-years, aimed at defining the minimum amount of physical activity required for good health.

- Children should participate in at least 60-minutes (and up to several hours) of moderate- to vigorous-intensity physical activity every day.
- Children should not spend more than 2-hours a day using electronic media for entertainment (e.g. computer games, internet, TV), particularly during daylight hours.

(Department of Health and Ageing, 2004).

American guidelines recommend that children participate in at least 60-minutes of moderate-intensity physical activity most days of the week, preferably daily (U.S.

Department of Health and Human Services, 2006b). New Zealand guidelines state that children and young people should participate in 60-minutes of moderate to vigorous physical activity throughout each day and spend less than 2-hours per day in front of the television, computers and game consoles (SPARC, 2007).

Subgroups of the population have recommendations to achieve specific health outcomes. Guidelines for older Australians are similar to those for Australian adults, however they emphasise that physical activity does not need to be strenuous and can easily be achieved by carrying out normal everyday activities (Department of Health and Ageing, 2003). Guidelines for the management of overweight and obesity in Australia state that for weight loss and to prevent regaining weight, at least 60-minutes of moderate-intensity physical activity 7-days a week is needed (Heart Foundation of Australia, 2007). Guidelines for Australians with Heart Disease are similar to those for Australian adults; however vigorous physical activity is not generally encouraged for people with CHD. They also advise beginning at lower intensity and duration and then gradually increasing over time (Heart Foundation of Australia, 2004).

In summary, guidelines for the health of adults are similar across a number of countries and generally recommend a minimum of 30-minutes of moderate-intensity physical activity most, if not all days of the week. In children, the guidelines suggest a longer duration of physical activity, with a number of countries recommending at least 60-minutes of moderate-intensity physical activity most, if not all days of the week. In specific populations the guidelines remain similar to those for adults, however, there are slight differences in the number of days per week needed for health benefits and the condition of the population can alter the type of activity recommended.

Measurement of physical activity

There are a number of techniques used to measure the level and intensity of physical activity in populations. This section gives a general overview of both objective and subjective methods and their reliability and validity. There are a number of considerations when selecting a measurement tool and these include accuracy and ease of use for large population studies.

Objective Measurement

An accelerometer is a small motion sensor which is commonly worn at the waist (Gretebeck & Montoye, 1992; Treuth, Sherwood, Baranowski, Butte, Jacobs & McClanahan et al., 2004), but can be worn on the wrist (Janz, 1994) or ankle (Shepherd, Toloza, McClung & Schmalzried, 1999). Accelerometers monitor movement in a plane, record the activity as counts (Trost, 2005) and record steps taken in real time (Shepherd et al., 1999). Accelerometers can measure the amount and intensity of movement and some models can store temporal patterns of activity (Freedson & Miller, 2000). There are two types of accelerometers; uniaxial which measure acceleration in a single plane, and triaxial which measure acceleration in three planes (Freedson & Miller, 2000). Accelerometers can measure the physical activity of children (Treuth et al., 2004; Telford, Salmon, Timperio & Crawford, 2005; Trost, 2005), adolescents (Trost, Pate, Freedson, Sallis & Taylor, 2000) and adults (Shepherd et al., 1999).

Accelerometers have shown a high level of accuracy for measuring physical activity. Eston, Rowlands and Ingeldew (1998) tested the validity of the following instruments; a uniaxial accelerometer, WAM (model 7164, Computer Science Applications, Shalimar, FL), a triaxial accelerometer, Tritrac-R3D (model T303, version 6.0, Professional Products, Reining, Madison, WI), a heart-rate monitor (BHL 6000 Medical, Fleurier, Belgium), and a pedometer (Digiwalker DW-200, Yamax, Tokyo,

Japan). Results showed that the triaxial accelerometer was the most accurate in assessing children's physical activity, however the CSA accelerometer (uniaxial), now termed Manufacturing Technology Inc. (MTI) (Telford et al., 2005) has been found to have moderate- to high-validity in children (Janz, 1994; Trost et al., 2000) and adolescents (Trost et al., 2000). A two-dimensional accelerometer, Step Activity Monitor (Stepwatch; Prosthetics Research study, seattle, WA, U.S.A) has been shown to accurately measure ambulatory activity in adults, including obese adults (Shepherd et al., (1999).

The CSA accelerometer has shown acceptable reliability when assessing physical activity behaviours in children (Argiropoulou, Michalopoulou, Aggeloussis & Avgerinos, 2004; Trost et al., 2000) and adolescents (Trost et al., 2000). The Caltrac (uniaxial) and the BioTrainer accelerometer have shown high test-retest reliability in middle-aged and older adults (Hageman, Norman, Pfefferkorn, Reiss & Reisberg, 2004).

Accelerometers are far more complex than pedometers (Freedson & Miller, 2000) and are considerably more expensive (McCormack & Giles, 2002). Over extended periods of time accelerometers can be an excellent tool to assess physical activity, however their high cost and administrative demands can limit their use in large-scale studies (Welk, Corbin & Dale, 2000).

Accelerometers are a valid and reliable instrument for assessing physical activity; however they have a number of limitations. They have been shown to overestimate energy expenditure during activity (Hageman et al., 2004) and cannot provide details on the type of activities participated in (Treuth et al., 2004), such as swimming, cycling and climbing stairs (Trost, 2005), or upper body activities such as throwing, catching, carrying or lifting (Welk Corbin & Dale, 2000).

A pedometer is a small electronic device that can be used to measure the walking habits of individuals. In general, pedometers are designed to detect vertical acceleration via an internal spring loaded lever that is in turn recorded and displayed as a step (Cuddihy, Pangrazi & Tomson, 2004). Pedometers are commonly worn at the waist, on either side of the body (Bassett, Ainsworth, Leggett, Mathien, Main & Hunter et al., 1996), but have been worn on the ankle (Eston, Rowlands & Ingledew, 1998) when weight on the abdomen is a concern (Shephard et al., 1999). Pedometers can be used to measure the number of steps a person takes across various time units, but most typically are reported on a per day basis (Freedson & Miller, 2000). Daily walking distance can be measured with a pedometer by establishing an individual's stride length with a simple walking test, such as recording the number of steps taken in a 10-metre walk (Bassett, Cureton & Ainsworth, 2000).

Pedometers are an effective way of measuring physical activity for people of all ages (Cuddihy et al., 2004). Pedometers have been used successfully with children (Trost, 2005; Rowe, Mahar, Raedeke & Lore, 2004), adolescents (Schofield, Mummery & Schofield, 2005), adults (Bassett et al., 1996; Tudor-Locke, Pangrazi, Corbin, Rutherford, Vincent & Raustorp et al., 2004c), as well as obese and sedentary individuals (Tudor-Locke, 2001). With simple instructions, adults are able to record and read data from a pedometer with few problems and then reset the pedometer for the next day (Tudor-Locke, 2001).

It is well documented that there are a number of benefits of using pedometers as an intervention tool, including an ability to detect increases in physical activity resulting from walking-based interventions (Tudor-Locke, 2001). Pedometers can be used as a motivational tool (Merom, Rissel, Phongsavan, Smith, Van Kemanade & Brown et al., 2007; Freedson & Miller, 2000; Bassett et al., 1996; Brisson & Tudor-Locke, 2004;

Schofield et al., 2005), for goal setting (Freedson & Miller, 2000; Brisson & Tudor-Locke, 2004; Bravata et al., 2007), self-monitoring (Freedson & Miller, 2000; Brisson & Tudor-Locke, 2004), recording daily steps per day (Freedson & Miller, 2000) gaining feedback (Brisson & Tudor-Locke, 2004) and in intervention studies (Freedson & Miller, 2000; Bravata et al., 2007).

There are two choices for recording pedometer readings during an intervention. Either the researcher records the data or the participants record the reading (Tudor-Locke, 2001). There are four options for collecting data from individuals; participants can submit their own results via phone or mail, return them to the researchers personally, return them to the researchers via mail, or researchers collect them from participant's homes. Participants can be blinded to the results on their pedometer if the researchers do not want the participants to see their results. In this case the memory capacity of the pedometer is important and may restrict the time period over which data can be collected. Middle-aged participants appear to understand and appreciate the rational for blinding; however this may not be the case for children (Tudor-Locke, 2001).

Walking is a popular physical activity performed by many individuals and therefore it is important to be able to accurately measure it. Motion sensors can be used to objectively measure walking activities and can include accelerometers and pedometers (Trost, 2005). The instrument used for measurement should be low cost, easy to administer to large populations, unobtrusive to participants and accurate (Freedson & Miller, 2000). Pedometers are a cost effective alternative to accelerometers (Trost, 2005) as they are small, low in cost (Freedson & Miller, 2000) and they show acceptable accuracy (Tudor-Locke & Myers, 2001). They are a practical measurement tool that enables researchers to assess walking habits of a population (President's Council on Physical Fitness and Sports, 2002b). Researchers acknowledge pedometers as a good

low cost solution for objective monitoring of walking, as they are easy to administer and score, are acceptable to participants and can be used by anyone (Tudor-Locke & Myers, 2001).

In respect to pedometer-based research, it is important that participants find pedometers acceptable to use as this will encourage compliance with the research protocols. The President's Council on Physical Fitness and Sports (2002b) reported that pedometers are light-weight and generally comfortable to wear. In a study by (Brisson & Tudor-Locke, 2004) adult participants did not indicate any problems with using pedometers during physical activity assessment. In addition, Tudor-Locke, Bassett, Swartz, Strath, Parr, Reis, et al. (2004a) found that pedometers are acceptable for long-term wear of up to one year and recording steps per day is not difficult.

The pedometer has been found to be a valid tool for assessing the walking component of physical activity. In a review of the methodological considerations of using pedometers, Tudor-Locke and Myers (2001) notes that while self-report methods are generally easy to administer, the self-reported walking behaviour records can often be unreliable. Pedometers provide a more accurate measure of distances walked, reasonably accurate estimates of steps taken and can be used to validate questions on questionnaires (Bassett et al., 1996). Pedometers can be very useful in studies aimed at determining changes in physical activity in children (Trost, 2005) and a study found that reactivity did not occur in children when recording their daily steps per day, even though they knew they were being monitored (Vincent & Pangrazi, 2002).

A study by Kilanowski, Consalvi and Epstein (1999) supported the use of pedometers for moderate- to high-intensity activity as well as less intense classroom activities for children. The pedometer showed significant differences in steps per day between physical and sedentary activities when behaviour was observed. As the

sedentary activities did not involve movement in the vertical direction, the pedometer did not register the activities as steps. Another study by Eston, Rowlands and Ingledew (1998) found that low intensity activities such as catching a ball and drawing with a crayon did not lead to significant counts on the pedometer compared to the large increases when participants began walking. In a test of the validity of ten models of commercially available pedometers, Schneider, Crouter, Lukajic and Bassett (2003) found that three models (New Lifestyles NL-2000 (NL), Yamax Digi-Walker SW-701 (DW) and Kenz Lifecorder (KZ) were exceptionally accurate in counting actual steps taken 95% of the time in adults.

Pedometers are gaining increasing respectability due to their capacity to quantify walking. While not perfect, pedometers can eliminate the errors associated with self-report or recall of physical activity information (Freedson & Miller, 2000). It is generally accepted that pedometers are an accurate tool for assessing typical walking behaviours (Brisson & Tudor-Locke, 2004), however, Schneider et al. (2003) found that only a small number of commercially available pedometer models were acceptable for research purposes. New Lifestyles NL-2000 (NL), Yamax Digi-Walker SW-701 (DW) and Kenz Lifecorder (KZ) were found to be the most accurate in recording actual steps and the intramodel reliability was exceptionally high. The authors suggest that the NL-2000 pedometer is an excellent option for researchers as they also have the ability to store seven days of data.

Pedometers are an effective way to measure physical activity; however they have a number of limitations. A pedometer is sufficient if examining walking behaviour (Freedson & Miller, 2000), but cannot be used to accurately measure activities such as swimming, cycling, skateboarding and rollerblading (Cuddihy et al., 2004). In addition, if activity patterns (such as intensity or periods of time) are needed then an accelerometer

should be used instead of a pedometer (Freedson & Miller, 2000) as pedometers cannot provide information about frequency, intensity or duration of physical activity (Trost, 2005). While pedometers are very accurate in counting steps taken, they are not as accurate in estimating distances traveled or energy expenditure (Brisson & Tudor-Locke, 2004).

A number of possible sources of error associated with pedometers have been identified by Tudor-Locke (2001). Movement during automobile travel may possibly register steps, as well as traveling via mail back to researchers. The site of attachment of the pedometer may also be a source of measurement error. Some pedometer manufacturers recommend attaching it at the waist centered over the dominant foot; however the optimal attachment site is unknown as some participants, such as the obese, may be unable to comfortably wear them in this position. According to Brisson and Tudor-Locke (2004) other measurement issues can include problems with pedometers falling off, especially in overweight individuals, slow walking can cause the pedometer to miss steps and bending or fidgeting movements can add steps to the daily count. Reactivity can also be an issue as there is a possibility that participants may change their behaviour whilst wearing the pedometer (Tudor-Locke, 2001). It is suggested that a brief walking trial is good practice before a study begins to try to avoid some of these issues and it is recommended that more research into this area be undertaken to help reduce the possibility of error (Tudor-Locke, 2001).

Subjective Measurement

Self-report measures are common measures used in physical activity research. They include interviewer and self-administered recalls, diaries and proxy-reports by parents and teachers, with recall timeframes varying from 1-day to 1-year (Trost, 2005).

Self-reporting can assess physical activity duration, intensity and frequency (Baranowski, 1988). Information collected can include the location and reasons for activity, the social environment (Baranowski, 1988), socio-demographics, parental and child physical and sedentary activities, barriers to physical activity, rules and restrictions on children's physical activity, social support for children's activities, parental perceptions of children's physical activity, the physical environment, weight concerns, family activities, enjoyment of physical activity, sedentary pursuits and snacks eaten while watching TV (Salmon, Telford & Crawford, 2004).

When studying physical activity, differences between adult's and children's ability to recall information accurately and their different patterns of activity should be considered (Welk, Corbin & Dale, 2000). The Children's Leisure Activities Study Survey (CLASS) showed acceptable reliability for both proxy- and self-report questionnaires in older children aged 10 to 12-years (Telford, Salmon, Jolley & Crawford, 2004), however, in young children parent proxy-reports may be a more viable method of collecting information (Trost, 2005) due to the less developed cognitive skills of young children (Welk, Corbin & Dale, 2000). A study on the reliability of self-report for adults showed acceptable test and re-test reliability in both men and women, providing reliable estimates of sufficient physical activity for health (Timperio, Salmon & Crawford, 2003).

The Active Australia survey is a short set of reliable and valid (Australian Institute of Health and Welfare (AIHW), 2003) easily administered questions designed to measure participation in leisure-time physical activities and to assess participant's knowledge of public health messages relating to the benefits of physical activity. There are eight core questions to assess participation in various activities and five statements to assess awareness of the current public health messages. Questions about demographic

information (age, sex and household information) can be added to the survey (AIHW, 2003).

It is important to have accurate measures of physical activity behaviours to evaluate interventions (Stone, McKenzie, Welk & Booth, 1998). In a study of male and female fifth grade students both self-administered and interviewer administered self-report measures have shown moderate validity (Sallis, Strikmiller, Harsha, Feldman, Ehlinger & Stone et al., 1996). Argiropoulou et al. (2004) concluded that three self-report questionnaires for children were valid and reliable instruments for recording physical activity and were able to detect changes.

The Active Australia survey has been used in numerous Australian adult targeted studies. The questions apply to physical activities 1-week before the survey is administered and it has shown acceptable validity in adults aged 18 to 75-years (AIHW, 2003).

There are a number of advantages to using self-report measures for physical activity. They can be quickly and easily administered to large class and are cost-effective (Trost, 2005). They provide more information about the activity a person typically does (Trost, 2005) including quantitative and qualitative information.

Self-report is an important method used to assess physical activity, but there are a number of limitations (President's Council on Physical Fitness and Sports 2002b). The measure may not be sufficiently sensitive to detect changes in activity (Timperio, Salmon & Ball, 2004), it is more complicated to obtain valid and reliable results from children, than from adults and some participants may over-estimate their physical activity, or they may misinterpret what the physical activities are (Stone et al., 1998; Welk, Corbin & Dale, 2000).

It is suggested by Treuth et al. (2004) that an interviewer-administered questionnaire with more guidance as to how to think about what they did and how to quantify their activity would improve the accuracy of self-report questionnaires, along with administering it on a second occasion to improve reliability.

Measurement of Walking as a Physical Activity

Walking is a simple and common physical activity that has been found to be associated with important health benefits, including a reduced risk of obesity (Brisson & Tudor-Locke, 2004) and cardiovascular disease (Armstrong, Bauman & Davies, 2000). Walking accounts for a large part of the daily energy expenditure individuals achieve through physical activity (Bassett, et al., 1996) and is frequently reported as being the most common leisure-time activity (Brisson & Tudor-Locke, 2004). Advantages of walking as a physical activity include the ability to be incorporated into daily activities such as exercise, recreation and transport (Armstrong, Bauman & Davies, 2000). Importantly, walking has a low risk of injury for people of all ages and physical activity levels as well as being an inexpensive activity that can be performed both indoors and outdoors (Gessell, 2004). Pedometers can be used effectively to measure walking. As walking is one of the most common physical activities, pedometers can be used to give an accurate assessment of physical activity of individuals and populations.

Prevalence of physical activity

Both objective and subjective measures have been utilised to establish physical activity levels of populations. This is important so as to ascertain whether physical activity guidelines are being met. This section describes current Australian and International data on the physical activity levels of both adults and children.

Physical Activity Levels of Adults

Participation in physical activity among adult Australians appears to be declining. Bauman, Ford and Armstrong (2001) highlighted the major findings from data collected on the physical activity patterns of Australian adults from 1997 to 2000. The percentage achieving sufficient physical activity for health benefits (at least 150-minutes of walking, moderate and/or vigorous activity per week) declined from 62.2% in 1997 to 56.8% in 2000. Those achieving sufficient time as well as 5-sessions per week declined from 50.9% in 1997 to 46.1% in 2000. Physical inactivity levels (sedentary behaviour) increased from 13.4% in 1997 to 14.6% in 1999 and 15.3% in 2000.

In Australia participation in exercise, recreation and sport declines consistently with age (Dale & Ford, 2002; Armstrong, Bauman & Davies, 2000), with some of the most marked declines seen among the young and middle-aged adults in 2000 (Bauman, Ford & Armstrong, 2001), with adults in their 40s and 50s even less active than the immediate post-retirement class (Bauman, Bellow, Vita, Brown & Owen, 2002). In 1999, the highest levels of participation in sufficient physical activity were demonstrated by 18 to 29–year-olds at 69%, with 45 to 59–year-olds demonstrating the lowest at 50% (Armstrong, Bauman & Davies, 2000). Sedentary behaviours also increased with age from 6% in individuals 18 to 29-years old to around 18% in those aged 45-years and over in 1999 (Armstrong, Bauman & Davies, 2000). Data from the 2002 Western Australian Adult Physical Activity Survey (McCormack, Milligan, Giles-Corti & Clarkson, 2003) demonstrated similar findings. Participation in vigorous physical activity for males decreased with age and almost twice as many 18 to 30-year-old males participated in sufficient levels compared to those in the 45 to 59-year age group.

The Victorian Population Health Survey 2006 (DHS, 2007) outlines recent survey results on physical activity in Victoria using self-reported telephone interview responses.

It was determined that approximately 30-35% of males aged 35 to 64-years are insufficiently active to meet the National recommendations of 30-mins per day, at least 5-days per week. Over a quarter of all adults were classified as having insufficient levels of participation. Data revealed that approximately 5% of males and females did not participate in any physical activity during the week prior to the survey. The results showed the prevalence of sedentary behaviours in adults increased with age from 4% in the 18 to 24-year age group to 7% in the 65-years and older group for males and 3% to 13% in females. Males aged between 45 and 54-years had a prevalence of 5% sedentary, the highest seen in males other than the 65-years and older group. The percentage of adults who did not participate in sufficient activity for health benefits was 28%, with both males and females in the 65-years and older class having the highest prevalence at 35%. A quarter of males aged between 45 and 54-years had insufficient physical activity levels.

The CLASS study looked at the activity levels of parents who had children either 5 to 6-years of age or 10 to 12-years of age. Participants were recruited from 19 State Primary Schools in Melbourne, Australia. Measures used for parents were self-report questionnaires. In this sample, only 40-50% of fathers were sufficiently active for health benefits and 53-56% of mothers (Salmon, Telford & Crawford, 2004), below the national estimates for males and females in the Australian population (Bauman, Ford & Armstrong, 2001).

Current trends for physical activity and age in the United States show that the percentage of adults reporting no participation in leisure-time physical activity increases with age (U.S. Department of Health and Human Services, 1996). In the United States over half the adult population does not participate in recommended levels of physical activity to achieve a health benefit (Centers for Disease Control 2005a). Results from the Behavioural Risk Factor Surveillance System (BRFSS) showed that participation in

physical activity declined from 1994 to 2004 with the lowest levels of leisure-time physical activity reported in 2004 at 21% for men and 26% for women (Centers for Disease Control 2005b). Barnes (2007) reports that the percentage of adults who engaged in no leisure-time physical activity increased to 40% in 2005, with the percentage of adults who engaged in regular leisure-time physical activity decreasing from 31.2% in 2000 to 29.7% in 2005. Adults are becoming less physically active in many facets of their lives with an increase in the percentage of adults who spend most of their day sitting, doing no lifting and are never active (Barnes, 2007).

Walking as a Form of Physical Activity

The Victorian Population Health Survey 2006 (DHS, 2007) reported that walking was the most prevalent form of activity among adults, with 28% of males and 26% of females indicating walking was their only form of physical activity. Further to this, for those participating in walking and some form of vigorous activity, 58% of were males and 61% females. In both sexes and for all age groups, walking was the only form of physical activity that increased markedly with age.

Walking has been identified as a specific activity carried out in several contexts, including exercise, recreation and transport. It is the most prevalent physical activity reported in Australian population surveys (Armstrong, Bauman & Davies, 2000) for both males and females across all age levels over 24-years of age in Australia (Dale & Ford, 2002). Males in the 30 to 44-year and 45 to 59-year age groups spent more time walking than performing any other physical activities (Armstrong, Bauman & Davies, 2000).

Pedometers are a tool used to measure walking behaviours and can count the number of steps a person takes per day. An age related decrease in the number of pedometer recorded steps per day is seen in adults from ages 25 to 74-years, with the decrease in males 11,900 to 6,700 and females 9,300 to 7,300 (Sequeira, Rickenbach,

Wietlisbach, Tullen & Schutz, 1995). A pedometer-based walking study of healthy adults with a mean age of 45-years showed that adults took an average of 7,370 steps per day over a 21-day monitoring period (Tudor-Locke, Ainsworth, Whitt, Thompson, Addy & Jones, 2001). A more recent study by Tudor-Locke, Ham, Macera, Ainsworth, Kirtland, Reis and Kimsey (2004c) showed that over a 1-week monitoring period adults with a mean age of approximately 48-years took an average of 5,931 steps per day, well below the 10,000 steps per day as recommended by Tudor-Locke & Bassett (2004) for health benefits. A study by (Welk, Differding, Thompson, Blair, Dziura & Hart, 2000) reported that adults who participate in structured vigorous activity had higher average steps per day than those who participate in light moderate activities. Table 1 gives an overview of average daily steps per day of adults taken from published studies.

Table 1

Studies of Pedometer-Based Daily Steps per Day for Adults

Author	n	Age (yrs)	Pedometer	Time	Steps per day (Mean +/- SD)
Tudor-Locke et al. (2005)	33 male 57 female	49.1+/-16.2 44.8+/-16.9	Yamax	7 days	6,838 +/- 3,643
Tudor-Locke et al. (2004a)	23	38 +/- 9.9	Yamax	1 year	10,082 +/- 3,319
Tudor-Locke et al. (2001)	109	44.9+/-15.8	Yamax	21 days	7,370 +/- 3,080
Tudor-Locke et al. (2004c)	76 male 133 female	48.4+/-16.3 47.4+/-17.5	Yamax	7 days	7,192 +/- 3,596 5,210 +/- 3,518
Tudor-Locke et al. (2002)	52	38.2+/-12.0	Yamax	7 days	9,638 +/- 4,030
Sequeira et al. (1995)	493	25-74	Pedoboy	7 days	Males (range) 6,700-11,900 Females (range) 7,300-9,300

In summary, available evidence indicates that participation in physical activity for both males and females declines with age. A large proportion of Australian males are not meeting the necessary physical activity requirements for health, with those in the middle-aged category among the lowest levels. In males and females, participation in physical

activity declines with each age group. Physical inactivity levels are increasing among educated middle-aged people, possibly due to increased work pressures and lack of time. Moderate-intensity physical activities have been shown to be the most effective for improving the health of Australians, with walking the most common form of moderate-intensity activity.

Physical Activity Levels of Children

Accurate data on the physical activity of children is sparse mainly due to difficulties in assessment, with children often unable to recall their past activities correctly (Telford et al., 2005). Objective measures such as pedometers and accelerometers can be used more effectively to assess physical activity by children (Trost, 2005; Rowe et al., 2004).

Physical inactivity in childhood and adolescence may track into adulthood (Raitakari et al., 1994) and therefore it is important that children participate in physical activity at an early age (Timperio, Salmon & Bull, 2004) to develop lifelong behaviours. Activity participation has been shown to decline with age, with health behaviours tracking through the adolescent years including physical activity, dietary choice and smoking (Stone et al., 1998). Raitakari et al. (1994) studied the physical activity levels of children and adolescents aged 12 to 18-years and found that physical inactivity tracks better than physical activity. The results showed 44% of highly active participants remained highly active over a 6-year follow-up period and 57% of the sedentary participants remained sedentary. Health benefits of physical activity and negative health factors associated with inactivity can also continue into adulthood (Taylor, Baranowski & Sallis, 2004; Raitakari et al., 1994), increasing the risk of illness, obesity, disability and premature death for those who are inactive (Booth et ., 2006).

The 2007 Australian National children's nutrition and physical activity survey (Department of Health and Ageing, 2007) measured physical activity levels according to

National guidelines. Seventy-four percent of boys and 60% of girl's aged 9 to13-years participated in at least 60-minutes of moderate to vigorous physical activity on most days (interpreted as three out of 4-days sampled). Pedometer steps per day were taken as an average over 6 or 7-days. Boys and girls aged 9 to 13-years took a mean of 12,961 and 10,875 steps respectively. A higher percentage of girls reached or exceeded recommendations for number of steps; however, the recommendations for girl's steps per day were lower than those for boys. The study also showed that the percentage of children meeting the recommended daily steps per day declined with age, particularly with girls over 14-years. On school holidays children expended 4-6% less energy than on school days or weekends and 13 to 19-minutes less moderate- to vigorous- intensity physical activity.

The NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004 showed that participation in physical activity has increased over the last 20-years, with three quarters of children aged 11 to 16-years meeting the recommendation of at least one hour of moderate to vigorous physical activity per day, with boys more active than girls and young children more active than older children (Booth et al., 2006).

A National survey on participation in cultural and leisure activities in Australia showed that 63% of children aged 5 to 14-years participated in at least one organised sport outside of school in 2006, an increase from 59% in 2000 (Australian Bureau of Statistics (ABS), 2006). Data from the SPANS study shows that boys were more active than girls in 2004 (Booth et al., 2006), and in 2006 69% of boys participated in organised sport compared to 58% of girls (ABS, 2006).

In a study on rural areas in Australia, Zask, Van Beurden, Barnett, Brooks & Dietrich (2001) reported that children aged 5 to 12-years spent more time participating in physical activity during lunchtime than recess and participation in both moderate and

vigorous physical activity was higher at smaller schools than larger schools. The findings in this study showed that less than 50% of boys participated in moderate- to vigorous-intensity physical activity and only 27% of girls participated in moderate to vigorous physical activity during school break times. Booth et al. (2006) found that girls in rural areas were more active than girls in the city.

The seasons can also affect children's participation in physical activities. Moderate- to- vigorous physical activity was measured in students in years six, eight and ten and results showed 80-90% did one hour of physical activity per day in summer (only 60% of year 10 girls achieved this). In winter boys remained the same, but far less girls achieved the recommended levels (Booth et al., 2006).

There is evidence to show that despite increases in physical activity many children remain inactive and activity declines with increasing age (Telford, 2004). The children's leisure activities study (CLASS) examined the physical activity of Australian children using accelerometry and self-report data. Accelerometry data recorded that children aged 5 to 6-years accumulated about 4-hours of moderate-vigorous physical activity per day and children aged 10 to 12-years accumulated about 2-hours per day (Telford et al., 2005). The CLASS study showed that older boys engaged in physical activity more frequently than girls, with older boys participating in one more type of activity per week and in both age groups and boys averaged more minutes in moderate- and vigorous-intensity activity than younger and older girls.

The Western Australian Child and Adolescent Physical Activity and Nutrition Survey 2003 (CAPANS) used pedometers to measure physical activity and found that on average primary school boys took 12,464 steps on school days, with girls taking 10,673 steps. On weekends, boys took 10,956 steps per day and girl's 9,839 steps (Hands, Parker, Glasson, Brinkman, & Read, 2004).

Findings from a review of physical activity interventions show that a large proportion of children and adolescents in the United States are not sufficiently active, with a higher proportion of girls insufficiently active than boys (Stone et al., 1998). A comparative study by Vincent, Pangrazi, Raustorp, Tomson, and Cuddihy (2003) on levels of physical activity in children showed that American children were the least active compared to children from Sweden and Australia. Children, aged 6 to 12-years, wore pedometers for four consecutive days. American mean steps per day for boys ranged from 12,554 to 13,872 and girls 10,661 to 11,383. This was slightly less than among Australians with boys ranging from 13,864 to 15,023 steps and girls 11,221 to 12,322 steps. Swedish children's steps per day were the highest ranging from 15,673 to 18,346 for boys and 12,041 to 14,825 for girls. In another report, steps per day of New Zealand children aged 5 to 11-years were measured in a study of in school and out of school physical activity. Boys averaged 15,606 steps per day and girls 13,031 (Cox, Schofield, Greasley & Kolt, 2006). Table 2 gives an overview of average daily steps per day of children taken from published studies.

Table 2

Studies of Pedometer-Based Daily Steps per Day for Children

Author	n	Age (yrs)	Pedometer	Time	Steps per day (Mean +/- SD)
Tudor-Locke et al. (2004d)	995 girls 959 boys	6-12	Yamax	4 days	Girls 10-12 12,290 +/- 3,105 13,625 +/- 2,899 13,405 +/- 2,104 Boys 10-12 15,118 +/- 4,203 16,707 +/- 4,179 17,074 +/- 2,904
Vincent et al. (2003)	563	6-12	Yamax	4 days	Girls (range) 11,221-12,322 Boys (range) 13,864- 15,023
Rowe et al. (2004)	299	10-14	Yamax	6 days	Weekday 9,504 +/- 3,200 Weekend 9,005 +/- 4,258
Cox et al. (2006)	45 boys 46 girls	5-11	Yamax	3 days	Boys (mean) 15,606 Girls (mean) 13,031
Loucaides et al. (2004)	73 boys 71 girls Urban schools	11-12yrs	Yamax	4 w/days Winter 4 w/days Summer	Winter 13,583 +/- 4,313 Summer 14,531 +/- 4,901

In rural areas in the United States, 35% of 5th grade students with a median age of 11-years did not meet the moderate activity standard of two or more 30-minute bouts of physical activity at an intensity of three metabolic equivalents (METS) or above. Physical activity was measured via a questionnaire and 32% of students did not meet the vigorous activity standard of one 30-minute block at six METs or above, with 57.3% of girls failing to meet this level. These findings suggest that in rural areas a third of fifth grade children are not meeting guidelines for participation in physical activity, with girls of particular concern (Pate, Trost, Felton, Ward, Dowda & Saunders, 1997). Students aged 11 to 12-years in rural areas in Cyprus were significantly more active in summer than students in urban areas with average daily steps per day of 16,450 compared to 14,531. However, in winter the urban students were more active with 13,583 compared to rural students 12,436 (Loucaides, Chedzoy & Bennett, 2004).

Although not reported on earlier in this chapter, heart rate monitoring can be used as a tool to measure physical activity. Some studies have used heart rate monitoring as an objective measure to determine physical activity levels. Physical activity in 10 to 13-year old New Zealand children was measured by Heart Rate (HR) monitors in a study by Calvert, Ross and Hamlin (2001). They found that 53% of children met the minimum guideline of 30-minutes of HR greater than 139-beats per minute (bpm) on three of the 4-days of monitoring. More boys than girls met this guideline and boys spent significantly more time with elevated HRs above 139bpm. Forty-eight percent of children spent at least 1-day without even 10-minutes of moderate-intensity physical activity. In a similar study of the HRs of British children Armstrong, Balding, Gentle and Kirby (1990) reported that boys had a significantly higher percentage of time with HRs above 139bpm on weekdays and Saturdays. Girls also showed a significant decrease in the percentage of time spent in activity as they aged. Thirty-six percent of boys and 51.5% of girls did

not spend 10-minutes with their HR above 139 bpm on weekdays and 71% of boys and 93% of girls did not achieve this on Saturday.

In a study of children aged 7 to 9-years in Dublin (Ireland), Hussey, Gormley and Bell (2001) found via parental questionnaires that 39% were participating in hard exercise for at least 20-minutes 3 or more times per week and a further 57% were participating in at least 20-minutes of light exercise three or more times per week. They also found that 14% of boys and 24% of girls participated in less than the minimum recommendations. Boys expended more energy and participated in more hard exercise than girls.

Types of Activity Children Participate In

Findings from the CLASS study indicated that younger children tend to engage in more non-organised or play activities such as running and skipping, whereas older children tended to engage in more structured activities such as team and ball sports (Telford et al., 2005). Sleap and Warburton (1996) found that the most common activities for children aged 5 to 12-years were soccer, brisk walking, general play and chasing games. Older children participate in more types of activities per week than younger children. In the CLASS study boys and girls participated in different types of activities, with girls generally participating in lifestyle activities such as bike riding, walking, swimming and dancing and the most frequently reported activities for boys included playground, bike-riding, down ball, sport class and Australian Rules Football (Telford et al., 2005).

Walking and cycling to school is reported to be a very important physical activity option for children. Travel to and from school was examined by Booth et al. (2006), with approximately 30% of year six students reporting that they walked to school everyday and these students spent about 10 to 15-minutes each day walking. This

number decreased to 20% in secondary school. Findings from the CLASS study on Victorian children showed that only 16% of children aged 10 to 12-years walk to or from school every day, 43% of children aged 10 to 12-years do not usually walk to school on any day of the week and only 7% cycled to or from school one or more times per week (Telford et al., 2005). Overall fewer students are walking or cycling to school than in the past.

In summary, participation levels in physical activity for children have been increasing, however rates of involvement still decline as children move into adolescence. Boys remain more active than girls as they age, with involvement in organised sports increasing for both sexes, but still markedly higher for boys than for girls. Walking and cycling for transport is declining and rates of overweight and obesity in children are increasing.

School-based interventions

School-based interventions are a common method for reaching children and families to change certain behaviours. This section provides an overview of previously reported studies that have used the school-setting to increase physical activity and health.

The school is an ideal environment for implementing physical activity interventions as the supportive infrastructure already exists (Sallis, Simons-Morton, Stone, Corbin, Epstein & Faucette, et al., 1992) and it allows for a large number of children to be reached (Dobbins, et al., 2001; Sallis et al., 1992). A study by Harrell et al. (1999) determined that a classroom-based approach targeting all students is better for the health of the population rather than targeting only those with CVD risk factors. Gortmaker, et al. (1999b) suggests that the feasibility of a study can be improved if it is part of the regular school curriculum. Further, using classroom teachers to deliver the study enables reinforcement of the intervention during the school day (Harrell et al., 1998). According

to Nader et al. (1996) there are strong theoretical reasons for also including family members in a school-based health promotion intervention as the family provides a major source of influence and modeling of health behaviours.

The Eat Well and Keep Moving program was a school-based intervention where classroom teachers delivered an interdisciplinary program aimed at improving diet and levels of physical activity among primary school children (Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, et al., 1999a). It was implemented over 2-years in Maths, Science, Language, Arts and Social studies classes. Classroom-based campaigns including home activities involving family members were also used. It showed improvements in dietary intake and a decrease in television viewing by the children and identified that a sustainable program must fit within the goals and financial constraints of schools, as well as suiting the administrators, principals, teachers, parents, students and other community members. Gortmaker, et al. (1999a) suggest that the Eat Well and Keep Moving program is suitable for implementation elsewhere as regular classroom teachers were involved in the actual teaching of the program and the program topics are able to fit into core subject areas and were taught as part of the regular school curriculum, thus improving its feasibility. Harrell et al. (1998) suggested that children possibly respond to interventions better when their peers are involved and classroom teachers are able to reinforce the intervention during the school day.

According to a review of physical activity interventions by Dobbins et al. (2001), projects that demonstrated a significant effect on physical activity duration (measured as number of minutes per hour/week engaged in moderate to vigorous activity) tended to be of longer duration than those that showed limited or no effect at all. The review suggests that an increase in physical activity duration levels were seen when interventions were implemented for 18-weeks or longer. However, it is suggested that projects of shorter

duration, but greater intensity, may be more effective than projects of longer duration, but minimal intensity. Two projects that demonstrated an increase in physical activity rates showed vast differences in the length of their interventions. One project lasted 9-months and the other 7-weeks, yet both showed a significant increase in physical activity rates. After an 8-week school-based intervention called the Cardiovascular Health in children study Harrell et al. (1998) found that a brief intervention can improve the CVD risk profile of children aged 7 to 12-years with multiple risk factors. Hopper, Munoz, Gruber, MacConnie, Schonfield & Shunk, (1996) examined a school-based exercise and nutrition program aimed at 2nd and 4th grade students over 10-weeks. The findings indicated that the school- and home-based groups increased their awareness and understanding of fitness and nutrition knowledge.

Planet Health was a school-based intervention aimed at decreasing obesity among boys and girls in grades six to eight. Classroom teachers were used to teach the lessons which were implemented into four subject areas as well as Physical Education. Female students showed a decrease in obesity after the 2-year intervention, but no changes were seen in boys (Gortmaker, et al., 1999b). Ransdell, Taylor, Oakland, Schmidt, Moyer-Mileur, Schultz (2003) implemented a 12-week intervention designed to increase physical activity and health-related fitness among girls and their mothers and compare the effectiveness of a home-based intervention to a community-based intervention. The results of the study showed a significant increase in participation in physical activity in both groups.

The Planet Health Educational program used an interdisciplinary approach, where the subject material was taught within the curriculum by the classroom teachers who had minimal Health Education training. Grade and subject skills and competencies were used that were appropriate to the students age and curriculum. The lessons included teacher

resources, behavioural and learning objectives, procedure, extension, or homework activities and student resources and handouts. Teachers had extensive input into the themed units and filled out surveys after lessons to monitor their implementation (Gortmaker, et al., 1999b).

It is clear that school-based interventions have the potential for changing the behaviours of students and their families as evidenced by a number of studies. However, the length of time needed to produce a significant effect in the population is unclear. Programs that were implemented by the classroom teacher appeared to be more feasible, with a number of programs choosing to use a cross-curricular approach due to the ability to fit the program into any curriculum.

Interventions to promote increased steps

More recently, pedometers are becoming increasingly useful not only for measurement purposes, but also as an intervention tool to motivate and promote physical activity in adults and children. This section provides an overview of studies that have used pedometers in this way to increase steps per day and therefore the physical activity behaviours of certain groups.

Bravata et al. (2007) evaluated 18 randomised controlled trials using pedometers to increase physical activity in adults. Results showed that intervention participants significantly increased their physical activity by an average of 2,491 steps per day more than control individuals, which is approximately 27% above pre-test. Table 3 provides an overview of the increase in daily steps per day for adults from intervention studies using pedometers.

Table 3

Studies of Pedometer-Based Interventions to Increase Steps per Day in Adults

Author	n	Age (yrs)	Intervention	Steps per day Pre	Post
Schneider et al. (2006)	38	30-60	36-week exercise prescription on sedentary, o/weight, obese adults	5,123	9,117
De Cocker et al. (2008)	866	25-75	12-month multi-strategy community based intervention	9,569	10,491
Tudor-Locke et al. (2004b)	47	53	16-week pedometer based, facilitated, physical activity intervention on o/weight, obese, sedentary Type 2 diabetics	5,754	9,123
Baker et al. (2008)	79	49	12-week pedometer based, community walking intervention	6,802	9,977

Pedometer-based intervention studies on children have also been effective in increasing steps per day (Rowlands & Eston, 2007). However, studies on children have demonstrated that pedometer feedback alone is not as effective in increasing steps per day as using rewards (Rowlands & Eston, 2007) or health education (Butcher, Fairclough, Stratton, & Richardson, 2007) as the intervention tools in conjunction with

pedometer-based motivational activities. Table 4 provides an overview of increases in daily steps per day for children from intervention studies using pedometers.

Table 4

Studies of Pedometer-Based Interventions to Increase Steps per Day in Children

Author	n	Age (yrs)	Intervention	Steps per day Pre	Post
Schofield (2005)	85	15	12-week physical activity self monitoring & education program	7,501	10,248
Lubans (2008)	124	14	6-month s/based intervention, pedometer & email support for physical activity and health	Boys: 13,306 Girls: 10,547	14,158 11,880
Horne et al. (2007)	100	9-11	14-week s/based intervention, visual & audio, physical activity prompts, rewards based	Boys: 13,452 Girls: 10,864	16,237 14,686

Limitations and issues of school-based interventions

There are a number of issues that arise when planning and implementing a school-based intervention and it is important to understand these limitations so they can be minimised. This section provides a brief overview of some reported limitations from previously conducted school-based studies.

A number of practical limitations pertaining to school-based intervention programs are discussed by Durlak (1995). As school-based programs are applied in real situations, it is not possible to control every aspect of the environment into which the program will be implemented. For example, due to the use of intact groups, it is often not possible to restrict who participates in an intervention. Similarly, assignment to intervention or control conditions, the length or intensity of the program may be determined by school dates, what information can be collected to evaluate outcomes, and when and how often it can be obtained. A limitation when trying to increase physical activity is that groups may already be active and therefore behaviour changes may be minimal (Ransdell, et al., 2003).

Another issue with school-based interventions can be the ability to enlist family involvement. According to Nader et al. (1996), the degree of family participation in health education interventions is generally low. However, Perry, Luepker, Murray, Hearn, Halper and Dudovitz et al. (1989) reported a high participation rate of 75% in a far less intense family intervention, using home-based correspondence format related to a classroom curriculum. Improvement in the effect on diet was seen, however the effect faded after a year. These studies suggests that families may be put off by an intervention if it is too involved and may be more likely to participate if it is less intense.

Fitting a program into the school curriculum and the willingness of staff to accept the program may be factors in the success of school-based interventions. Nader, Sallis, Rupp, Atkins, Patterson and Abramson (1986) reports that difficulties in gaining sufficient curriculum time to influence health behaviour makes it difficult to be effective. A good example of this is the 'Know Your Body' program, which was not overly successful due to the following. Commitment from the school was hard to obtain due to the reluctance to give up time to the program. Teacher commitment was also difficult to

obtain due to the extra time required to prepare the lessons and that the risk factor examination component of the program took up far too much time (Walter, 1989).

Summary

In summary, there is a large body of evidence linking regular participation in physical activity with positive health outcomes, including a reduction in risk factors for CVD, such as overweight, obesity and type-2 diabetes. This evidence has led to the development of physical activity guidelines aimed at improving the health of certain populations. Unfortunately, despite this knowledge many Australian adults and children remain inactive and are currently not participating in sufficient levels of physical activity for health benefits. In adults there appears to be a steady decline in levels of physical activity with increasing age. Insufficient levels of participation are seen in a high number of middle-aged adults, in particular males, who can be at high risk of morbidity and mortality from CVD as they age. It is also particularly important for children to develop good physical activity behaviours when they are young because evidence suggests that physical activity and therefore inactivity tend to track into adulthood. This is one reason why a large number of interventions have been implemented within a school setting, so as to help children identify and develop lifelong physical activity behaviours. Other reasons for school-based interventions include the ability to reach large numbers of people, including family members and importantly these programs can be implemented directly into an already existing curriculum with teachers able to deliver the content. Emerging research on the use of pedometers as an intervention tool has produced promising results, with a number of studies, both school- and community-based demonstrating increases in steps per day for both adults and children. This project is unique and novel in its design and the results will inform the development of programs designed to improve community health through the knowledge and influence of children.

CHAPTER III

METHODS

This section provides a description of the research design used in this study. It is separated into two areas. Study 1 describes the intervention program for both parents and children, including the research questions, participants and setting, development of the intervention, instrumentation and data analysis. Study 2 describes the process involved in delivering the program, including the research question, participants and setting, development of the intervention and the process evaluation methods.

STUDY 1

It is important to assess the ability of interventions to produce the beneficial outcomes they are designed to deliver. Therefore, the purpose of study 1 was to evaluate the effectiveness of the 'Walk your Dad' program, a school-based cross-curricular pedometer intervention, on increasing the physical activity behaviours of children and their paternal parent. We selected middle-aged males for the intervention as they demonstrate lower engagement in physical activity (Armstrong, Bauman & Davies, 2000). Children in grades 5/6 were chosen because they are the most likely among all primary-aged children to have middle-aged fathers. In the CLASS study children aged 10 to 12-years old, had the highest incidence of parents within the middle-aged class; for girls aged 10 to 12-years, 65.1% of fathers were aged 40-49 years and for boys it was 62.6% (Salmon, Telford & Crawford, 2004).

Research Questions

The 'Walk your Dad' study 1 was developed to address the following research questions:

1. Can children be educated through a school-based cross-curricular intervention to increase paternal physical activity behaviour?

2. Is the physical activity behaviour of children altered after undertaking a school-based cross-curricular intervention designed to increase paternal physical activity behaviours?

Participants and setting

The study was approved by the RMIT University Human Research Ethics Committee (Appendix A) and the intervention and data collection occurred between July and November 2005. Eltham College of Education support for the study was provided by the College Deputy Principal (Appendix B). Parent and child participant progress throughout the entire program is outlined in Figures 1 and 2 respectively.

Figure 1

Flow diagram of parent participant progress through the phases of the program

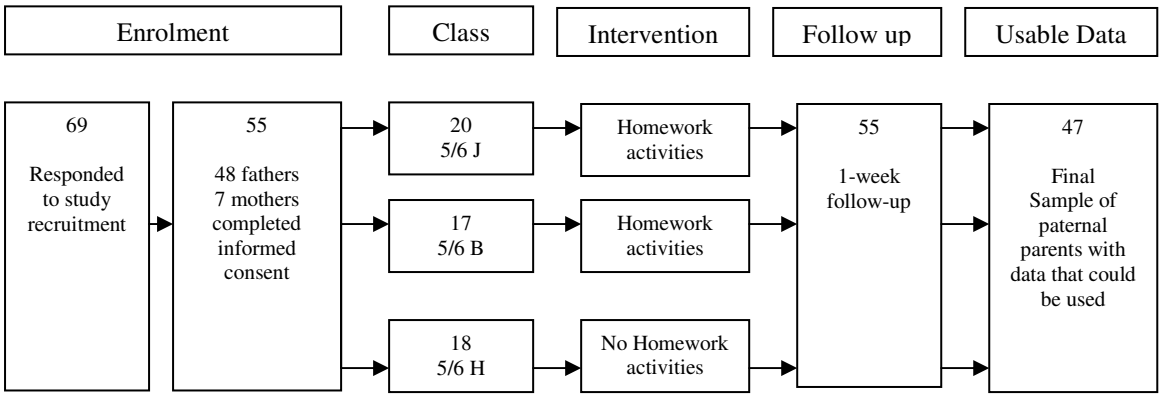
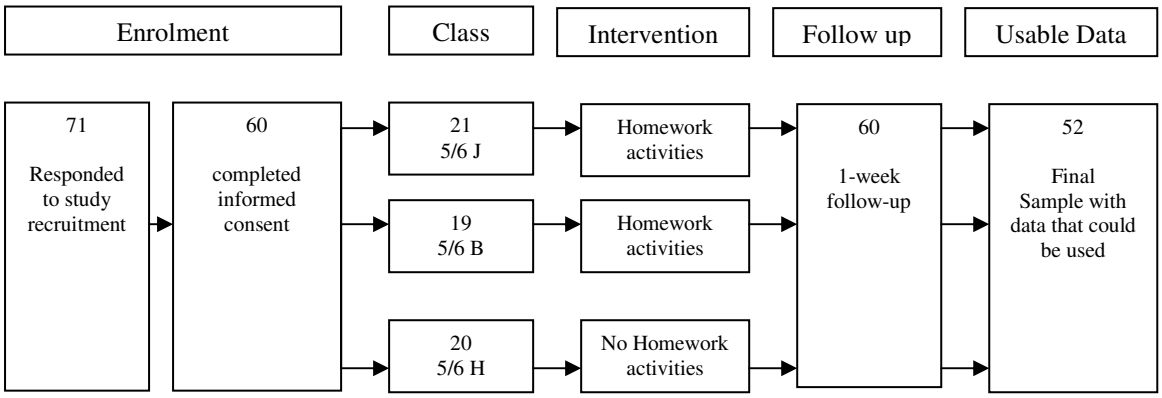


Figure 2

Flow diagram of child participant progress through the phases of the program



Participants were recruited via the school. Children were given an explanation of the program during an assembly and were handed an information pack to take home to their parents. This pack included a parent and child information letter (Appendix C); an informed consent form for parents and children (Appendix D); and a parent and child physical activity readiness questionnaire (Appendix E). All children in the three grade 5/6 composite classes at Eltham College of Education were invited to participate in the study, and 71 received study recruitment information. Both parental and child consent was required for participation. Eleven parents opted not to participate and did not give consent for their child to participate. Three parents gave consent for their children, but not for themselves. Two adults had twin children, both with one child in an intervention group class and one in the control group class. The children without permission to participate in the study were included in all intervention activities, except testing, as the intervention activities were integrated into their normal school learning tasks. The percentage of parent and child participant uptake in this program was 80% and 85% respectively.

As seen in figures 1 and 2, the study population included 60 children (30 boys and 30 girls) enrolled in composite grade 5/6 classes (ages ranged from 10 to 12-years) at Eltham College of Education in Melbourne, Victoria. The paternal parent of each child was asked to participate, however children without a paternal parent were advised to select another male from their household, or their maternal parent. Fifty-five parent participants took part in the study (48 paternal parents and 7 maternal parents) with ages ranging from 35 to 64-years of age.

The classes involved were three composite (meaning two year levels in the one class) grade five and six mixed gender classes. Two classes were assigned to an

intervention group and received the educational (intervention) program. One class was assigned to a control group and they did not receive the program.

Development of Intervention

The 'Walk your Dad' program was a school-based, cross-curricular intervention, designed with reference to Social-Cognitive theory as explained by Taylor, Baranowski & Sallis (2004). This theory explains the health behaviours of families, suggesting that children's behaviour can influence the behaviour of their parents. Snyder & Purdy (1982) refer to this as reverse socialization or reciprocal effects. The authors explain that parents may show a greater interest in sports if their child is involved, which may lead to them being more involved themselves. Taylor, Baranowski & Sallis (2004) suggest that social incentives within a family can be a powerful motivator for physical activity, including gaining respect and approval of family members and spending time together.

While there are very few studies on the influence children can have over parental physical activity, there are a number of studies that have concluded that children can influence consumer goods purchasing decisions of parents (Beatty & Talpade, 1994; Kim & Lee, 1997). Polachek & Polachek (1989) suggest that this influence children can have over family behaviours can result through education.

The 'Walk your Dad' intervention was delivered by classroom teachers and consisted of a 12-week educational program. This length of time has been shown to be sufficient to achieve a significant increase in participation in physical activity in both girls and their mothers after a 12-week physical activity intervention (Ransdell, et al., 2003). In the literature there is no clear guidance to the optimal amount of time for an intervention to have an effect, so pragmatic considerations, curriculum constraints and units of study weighed heavily on the ultimate time implemented for this study, as well as the acceptability of the intervention length for the teachers.

Pragmatic considerations determined the scheduling of the intervention within the school year. After lengthy discussions with the classroom teachers, and taking into consideration various school events likely to cause disruption to the conduct of the study, the units of work being offered in term three (July to September) and term four (October to December), were deemed most appropriate. As the program could not fit entirely within a school term, it was commenced in mid-August and ran for 5-weeks, continued in the form of 3-weeks of holiday homework and then it continued for the first 4-weeks of term four.

In this study two homework activities were distributed and explained to the children by the classroom teacher during class on the Monday of each in-term week (Appendix F). As was normal practice in the school, homework activities were required to be completed and submitted to the teacher by the following Monday. Children created a folder with all completed activities to be kept together. Each week the teachers were instructed to reflect on the previous week's homework activities for approximately 15-minutes with the children before distributing and explaining the following week's homework activities. The homework activities were developed to take approximately 30-minutes each to complete. The homework activities were linked to the Victorian Essential Learning Standards (VELS) level four for grade five and six children. The classroom teachers were given a list of Frequently Asked Questions (FAQs) (Appendix G) and instruction sheets (Appendix H), which provided an explanation for every homework activity and included ideas for reflection as well as teacher comments/feedback on each individual homework activity.

Instrumentation

Physical activity for both children and parents was measured before beginning the intervention phase and post-tests were undertaken at its completion. Measures included

pedometer data which was collected during the 2-weeks prior to the intervention and 2-weeks after the intervention, as well as survey data derived from the process evaluation of the intervention. As only 60 pedometers were available to the study, child and parent pairs were selected at random to wear the pedometers in the first or second week of data collection at both pre- and post-test periods.

Prior to the pre-testing parent and child surveys were collected to form part of a larger project and therefore have not been reported on in this study. A PAR-Q for physical activity readiness was completed by parents for themselves and their child to ensure that all participants could participate safely in the promoted activities. The PAR-Q was sent home via the child and returned to the school on completion via the child. Only objective measurements of the child and parent participants have been used. A review of interventions delivered to primary school-aged children reported that those using objective measures of physical activity reported positive findings in 12 out of 18 studies compared with 12 out of 34 studies that used survey measures. A further six that used both measures demonstrated positive or at least weak effects from the objective measures, but no effect based on surveys (Salmon, Booth, Phongsavan, Murphy & Timperio, 2007).

Pedometers

The New Lifestyles (NL-2000) brand of pedometer was used for pre- and post-testing. This brand has been found to be reliable for research purposes and has 7-day memory function (Schneider, et al. 2003). Participants wore their pedometer according to manufacturers' specifications during all waking hours, except when showering or water-based activities and during contact sports. The child participants were instructed during an in-class instruction session on how to wear the pedometer. Following this session, child participants were given a pedometer, appropriately labeled for

identification purposes, for their parents and information that included an instruction sheet on correct use and care of the pedometer and instructions for return to school via the child (Appendix I). The pedometers were worn on the hip and were sealed with a zip lock tie. A study by Vincent and Pangrazi (2002) found that there is no reactivity in children when pedometers are sealed. Sealing pedometers so adults can't see the distances walked could also be advantageous as it can deter adults from modifying their behaviours and can prevent the pedometers being accidentally reset (Tudor-Locke, 2001). According to Tudor-Locke and Myers (2001) middle-aged participants appear to understand the rationale for sealing pedometers.

In a study by Gretebeck and Montoye (1992), it was reported that five to six days of pedometer data was required to accurately describe activity patterns with less than 5% error. Janz, Witt and Mahoney (1995) concluded that in field settings four or more days of activity monitoring using an accelerometer was needed to achieve satisfactory reliability. A study conducted by Trost et al. (2000) on activity monitors showed that in order to achieve a reliability of 0.80 in children in grades four to six, 4- to 5-days was needed. Trost et al. (2000) found that it is necessary to include weekend days in objective physical activity measurement for children. In this study pedometers were worn for six consecutive days.

It is recommended to routinely conduct pilot work with the intended population when using pedometers for research (Tudor-Locke, 2001). Prior to undertaking the pre-test testing a trial was performed using a 9-year old female child from the school to ensure that the pedometer could be worn by children in both Summer and Winter uniforms in-class and sport uniforms while walking, running and stair climbing. The trial was performed on a treadmill at RMIT University and on stairs adjacent to a laboratory. Three investigators independently counted steps completed by the child during each trial.

The trial confirmed that the New Lifestyles pedometer could be worn correctly and record steps accurately, regardless of the uniform type being worn or movement on flat or ascending and descending surfaces.

In this study, the pedometers were distributed to children in class on a Monday and children and parents were instructed to wear them from waking on Tuesday morning until retiring to bed on Sunday evening. Pedometers were then returned on the following Monday morning. Due to the number of children and parents involved exceeding the supply of pedometers, two rounds of testing were required. Children and their parent were randomly allocated into a round one or a round two group for the purpose of pedometer assignment. When pedometers were returned on the Monday morning by round one participants, investigators downloaded and recorded the information, re-set the pedometers and sealed them with a plastic tie, and then distributed them to the round two participants on Monday afternoon.

Data Analysis

To enable statistical analysis to occur pedometer and survey data were entered into an SPSS data file. After inspection, a small amount of data was revealed to be missing. Missing data was then estimated using a missing data replacement model. Rowe et al. (2004) and Kang, Zhu, Tudor-Locke and Ainsworth (2003) suggest an individual-centred approach as the best method for replacing missing data. Expert advice was also sought from a personal communication and confirmed individual-centred replacement as best approach for this data set.

The imputation system used in this study for replacement of missing data is explained by Elliott and Hawthorne (2004). Missing data was replaced by measured data obtained from another participant from the same class and of the same gender with the closest matching data on other days, with weekend and weekday data treated separately.

To replace missing data a minimum of 50% of data was required to exist pre-imputation for the participant for each category of day (i.e., 1-weekend day or 2-weekdays needed). Participant results with less than 50% data were removed and replaced with the missing data value 999.0. Data was replaced with the data from the same day of another child (or parent in the parent data set) with closet fit to their other data. To replace data participants had to be of the same sex, preferably same class (either control or intervention class at post-test if not the same class) and same age was applied in all but a few cases for children. Each case of replaced data was checked by an expert and entered into the SPSS data file as a separate column of data so as to preserve original and imputed data for each participant. The original and imputed data set has been included in Appendix L.

Following replacement of missing data, tests were performed on the data set to check for outliers. Rowe et al. (2004) suggests high and low outlier pedometer steps per day as being less than 1,000 steps and greater than 30,000 steps, and recommends these values as outlier cut-offs for children. Tabachnick & Fidell (2001) suggest that an outlier value can remain in the analysis; however values can be transformed or changed to reduce their impact. Exploratory data analysis in SPSS highlighted values in box plots that were outliers. A decision was made to modify these scores as suggested by Tabachnick & Fidell (2001), rather than delete them and reduce the statistical power of the analysis and in light of the exploratory nature of this project. Each value was replaced as per the missing data replacement strategy described previously. The majority of outliers were replaced, however a decision was made to leave a small number of values where pre- and post-test scores of a participant were very similar (defined as within 2,000 steps) and appropriate data imputation replacements could not be found. A secondary exploratory data analysis after initial outliers were replaced highlighted some

new outliers in the data. A decision was made to leave these outliers in the data set which was subsequently analysed.

Participant attrition is a common problem in research conducted with volunteers in free-living environments. To allow for a full data set, preserve statistical power and reduce bias, an intention-to-treat (ITT) approach was applied to all participants using the last value carried forward approach. As this study involved data collection at only two time points, pre-test data was carried forward into post-test data for participants who did not complete post-test. The ITT approach is described by Hollis and Campbell (1999) and Gravel, Opatrny & Shapiro (2007) as a strategy for randomised control trials that compares participants in the groups they were originally assigned to. This allows all participants data to be analysed whether they received the intervention or not, withdrew from the study, or had missing data.

Following data cleaning, imputation and carry forward, data was analysed using SPSS for Windows (Version 15). Child participant data was analysed using a 2 (condition) x 2 (sex) repeated measures ANOVA for weekday and weekend steps per day. Paternal parent participant data was analysed with a 2-way (condition) repeated measures ANOVA for weekday and weekend steps per day.

STUDY 2

The purpose of study 2 was to evaluate the acceptability of the 'Walk your Dad' program to teachers.

Research Question

The 'Walk your Dad' study 2 was developed to address the following research question:

1. Is the design of the 'Walk your Dad' program acceptable to classroom teachers?

Participants and setting

The three classroom teachers were all females with teaching experience ranging from 12 to 15-years. None of the classroom teachers had (1) ever taught in a school as a specialist physical education teacher; or (2) were required to teach physical education at Eltham College of Education.

Development of intervention

Crowded curriculums have been linked to reluctance of teachers to support innovations (Walter 1989). Therefore, the 'Walk your Dad' study was aligned to the existing curriculum, using homework activities to reduce the amount of time needed in class. The homework activities were cross-curricular, sequence to align with planned in-class activities and linked to Victorian Essential Learning Standards (Victorian Curriculum Assessment Authority), the framework that school curriculums are based on, with Level four the standard for grades 5/6 (see Appendix F). The central ideas for homework activities came from a number of pedometer lesson plans developed by others and available publicly (e.g., Walk Smart; PE Central). The investigator used these sources and developed each homework activity targeting a grade 5/6-level.

Other school-based interventions have used classroom teachers in the delivery of their program. For example, in The Planet Health Educational program the lessons included teacher resources, homework activities and handouts. Teachers had extensive input into the themed units and completed surveys after lessons to monitor their implementation (Gortmaker, et al., 1999b). Similarly, the classroom teachers in the 'Walk your Dad' study were provided information about the program and activities directly and were also asked for their input. Instruction sheets, including a feedback section to be completed after each lesson, were provided to the teachers along with homework activities.

Process evaluation methods

The 'Walk your Dad' program was designed as an exploratory study to assess the effectiveness of the concept with the view to collect information for a larger trial. Baranowski and Stables (2000) suggest it is important to evaluate the impact of health promotion interventions so some of the weaker aspects of a programs performance can be explained and program designers can identify which components need to be improved. Process evaluation data collected by Gibson, Smith, DuBose, Greene, Bailey, Williams, et al., (2008) from a school-based physical activity intervention was used to evaluate the extent of delivery of the original program by the classroom teacher, the extent the program had been implemented and to assess engagement in the program by teachers and students. Steele, Mummery & Dwyer (2007) conducted surveys at post intervention of a 12-week physical activity intervention using both questions on a 5-point scale and open ended questions. The process evaluation in the 'Walk your Dad' study was also conducted via post intervention surveys. The teacher evaluation surveys included questions relating to the appropriateness of the activities, the ability to fit the program into the current curriculum, the delivery of the program and the length of time of the program (Appendix J). Open questions were asked about the content of the program and their ability to deliver it.

CHAPTER IV

RESULTS

STUDY 1

Participant characteristics

This section describes the participant demographics and the mean results of pedometer steps per day.

A total of 69 paternal parents were invited to participate in the 'Walk your Dad' study (two paternal parents were the parents of twins). The response rate for paternal parents agreeing to participate in the study was 70%. Seven mothers also took part in the study, however their results have not been analysed. Of the 48 paternal parents who participated, the final sample consisted of only 47 due to one father with missing data that could not be replaced using the replacement strategies. Sixty-three percent of paternal parents were in the intervention classes and 37% in the control class. Age of the paternal parents ranged from 35 to 64-years. The characteristics of the paternal parents are presented in Table 5.

Table 5

Characteristics of Parent Participants

Demographic Category	Number	Percent
Gender		
Male	48	87%
Female*	7	13%
Class		
5/6J (Intervention 1)	20 (male – 17)	36% (male – 35%)
5/6B (Intervention 2)	17 (male – 13)	31% (male – 27%)
5/6H (Control 3)	18 (male – 18)	33% (male – 38%)
Intervention	37 (male – 30)	67% (male – 63%)
Control	18 (male – 18)	33% (male – 37%)
Age (years)		
35 - 39	5 (male – 5)	9% (male – 10%)
40 - 44	20 (male – 18)	36% (male – 38%)
45 - 49	20 (male – 16)	36% (male – 33%)
50 - 54	7 (male – 7)	13% (male – 15%)
55+	3 (male –2)	6% (male – 4%)

Note: Female (maternal parent) data not analysed
(male) is the number of males and percentage value refers to males only

Pedometer steps for two weekend days and pedometer steps for four weekdays were used as outcome measures of physical activity. The mean scores of the outcome measures for paternal parents are summarised in Table 6 and Table 7 (mean scores for original, pre-imputed data are found in Appendix K).

Table 6

Mean Results of Pedometer Steps on Weekends for Paternal Parents

Variables	n	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Intervention	29	15,116.38 +/- 5,640.19	17,473.38 +/- 6,835.75
Control	18	18,238.67 +/- 8,344.93	17,835.67 +/- 6,854.75
Total	47	16,312.15 +/- 6,888.63	17,612.13 +/- 6,770.48

Table 7

Mean Results of Pedometer Steps on Weekdays for Paternal Parents

Variables	n	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Intervention	29	31,140.69 +/- 13,245.92	31,506.86 +/- 13,131.70
Control	18	34,941.61 +/- 11,108.91	32,502.22 +/- 12,602.18
Total	47	32,596.36 +/- 12,485.74	31,888.06 +/- 12,802.19

A total of 71 grade 5/ 6 children were invited to participate in the 'Walk your Dad' study. The response rate for children with permission to participate was 85%. However, of the 60 children who participated, the final sample consisted of 52 due to missing data that was unable to be replaced using the replacement strategies; this was due to insufficient original data (less than 50%) being available on which to determine replacement data. The participants consisted of children from grade 5/6, with the majority being in grade six (42% grade five and 58% grade six) with an equal distribution

of males and females. Sixty-seven percent of the participants were in the intervention classes and 33% were in the control class. The characteristics of the child participants are presented in Table 8.

Table 8

Characteristics of Child Participants

Demographic Category	Number	Percent
Gender		
Male	30	50%
Female	30	50%
Class		
5/6J (Intervention 1)	21	35%
5/6B (Intervention 2)	19	32%
5/6H (Control 3)	20	33%
Intervention	40	67%
Male	20	50%
Female	20	50%
Control	20	33%
Male	10	50%
Female	10	50%
Grade		
5	25	42%
6	35	58%

Pedometer steps for two weekend days and pedometer steps for four weekdays were used as outcome measures of physical activity. The mean scores of the outcome measures are summarised in Table 9 and Table 10 (mean scores for original, pre-imputed data are found in Appendix K).

Table 9

Mean Results of Pedometer Steps on Weekends for Children

Variables		n	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Boy				
	Intervention	17	16,538.41 +/- 8,341.79	21,733.12 +/- 11,540.27
	Control	10	18,424.50 +/- 6,235.55	20,247.30 +/- 6,709.82
	Total	27	17,236.96 +/- 7,559.27	21,182.82 +/- 9,903.27
Girl				
	Intervention	17	14,333.24 +/- 7,036.46	17,417.71 +/- 9,268.59
	Control	8	17,425.50 +/- 7,322.75	13,566.63 +/- 5,005.23
	Total	25	15,322.76 +/- 7,128.48	16,185.36 +/- 8,242.56
Total				
	Intervention	34	15,435.82 +/-7,680.93	19,575.41 +/- 10,536.59
	Control	18	17,980.50 +/- 6,551.76	17,278.11 +/- 6,768.98
	Total	52	16,316.67 +/- 7,346.91	18,780.19 +/- 9,398.25

Table 10

Mean Results of Pedometer Steps on Weekdays for Children

Variables		n	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Boy				
	Intervention	17	56,864.06 +/- 12,194.30	56,638.65 +/- 10,916.67
	Control	10	50,072.40 +/- 11,731.09	46,188.40 +/- 12,174.19
	Total	27	54,348.63 +/- 12,260.33	52,768.19 +/- 12,291.78
Girl				
	Intervention	17	35,315.06 +/- 11,518.74	40,881.18 +/- 11,535.99
	Control	8	42,949.75 +/- 5,428.00	40,627.88 +/- 6,724.47
	Total	25	37,758.16 +/- 10,500.46	40,800.12 +/- 10,095.67
Total				
	Intervention	34	46,089.56 +/- 16,001.11	48,759.91 +/- 13,647.71
	Control	18	46,906.78 +/- 9,912.22	43,717.06 +/- 10,255.12
	Total	52	46,372.44 +/- 14,091.66	47,014.31 +/- 12,706.12

Pre-test data analysis

To determine if there was a significant difference between classes at pre-test, a one-way ANOVA for class and one-way ANOVA for condition were performed for both child and paternal parent data. Analyses revealed no significant difference between class or condition on any outcome measure at pre-test. Results of the pre-test data analyses for class are found in Table 11 and results for condition are found in Table 12.

Table 11

Results of One-Way ANOVA for Pre-Test Data Analysis of all 3 Classes

Outcomes Variables	*F*	Hyp Df	Error df	*p*
Weekend Steps				
Children	0.996	2	49	.377
Parent	0.739	2	51	.483
Weekday Steps				
Children	0.967	2	56	.386
Parent	1.504	2	53	.232

Table 12

Results of One-Way ANOVA for Pre-Test Data Analysis of Condition

Outcomes Variables	*F*	Hyp Df	Error df	*p*
Weekend Steps				
Children	1.424	1	50	.238
Parent	1.503	1	52	.226
Weekday Steps				
Children	0.201	1	57	.655
Parent	0.542	1	54	.465

Impact on physical activity behaviour of participants

A 2 x 2-repeated measures ANOVA was used to analyse the outcome measures within participants and between participants. For paternal parent participants, the between participants factor was condition (intervention, control) and the within participants factors were weekend steps (pre, post) and weekday steps (pre, post). A statistically significant difference was found within the factors for weekend steps, $F = 77.06$, $p < .001$, but not weekday steps, $F = .002$, $p = .97$. There was a significant difference in weekday steps between participants in the intervention and control class, $F = 4.04$, $p = .050$, supporting the hypotheses that the intervention would alter the physical activity of adult paternal participants, however, there was no difference in weekend steps, $F = .035$, $p = .85$. Results of the repeated measures ANOVA for paternal parents are found in table 13.

Table 13

Results of Repeated Measures ANOVA for Paternal Parents Following Completion of 12-Week Intervention

Outcomes Variables	Value*	*F*	Hyp Df	Error df	*p*
Weekend Steps					
Within Participants	.369	77.059	1.00	45.00	.000
Between Participants (c)	.999	0.035	1.00	45.00	.852
Weekday Steps					
Within Participants	1.000	0.002	1.00	45.00	.966
Between Participants (c)	.918	4.040	1.00	45.00	.050

Note: *Wilks Lambda

(c) = condition

For children, the between participants first factor consisted of sex of child (boy, girl) and the second factor was the condition (intervention, control). The within child participant factors were weekend steps (pre, post) and weekday steps (pre, post). A statistically significant difference was found within the factors for weekend steps, $F = 575.86$, $p < .001$, but not weekday steps, $F = .413$, $p = .52$. There was a significant difference in weekday steps between participants in the intervention and control class, $F = 6.817$, $p = .012$, partially supporting the hypotheses that the intervention would alter the physical activity of children, however, there was no difference in weekend steps, $F = .984$, $p = .33$. Also adding partial support for the hypotheses was a significant difference in weekend steps between-within participants, $F = 7.246$, $p = .010$, but not weekday steps, $F = .87$, $p = .36$. There was a significant difference in weekend steps by sex, $F = 13.962$, $p < .001$, with boys and girls showing a between-within subject difference, but no difference was seen in weekday steps, $F = .003$, $p = .96$. Results of the repeated measures ANOVA for child participants are found in Table 14.

Table 14

Results of Repeated Measures ANOVA for Child Participants Following Completion of 12-Week Intervention

Outcomes Variables	Value*	*F*	Hyp Df	Error df	*p*
Weekend Steps					
Within Participants	.077	575.86	1.00	48.00	.000
Between Participants (s)	.775	13.962	1.00	48.00	.000
Between Participants (c)	.980	0.984	1.00	48.00	.326
Between Participants (s/c)	.869	7.246	1.00	48.00	.010
Weekday Steps					
Within Participants	.991	.413	1.00	48.00	.524
Between Participants (s)	1.000	.003	1.00	48.00	.958
Between Participants (c)	.876	6.817	1.00	48.00	.012
Between Participants (s/c)	.982	.868	1.00	48.00	.356

Note: *Wilks Lambda

(c) = condition
(s) = sex

STUDY 2

Process Evaluation

The two teachers from the intervention classes completed the process evaluation survey at the conclusion of the 12-week intervention. Table 15 lists the findings of the multiple-choice option section of the survey.

Table 15

Teacher Ratings Measuring the Delivery of Homework Activities

Question	T1	T2
Did you find the homework activities easy to explain to students?	Always	Always
Do you think the activities were appropriate for the age of the students?	Mostly	Mostly
Do you think the activities were appropriate for the parents?	Mostly	Sometimes /Rarely
Did you think that the homework activities were enjoyable and interesting for the students?	Sometimes	Sometimes
Did you think that the homework activities were enjoyable and interesting for the parents?	Mostly	Rarely
Did you have time to reflect on every homework task?	Sometimes	Sometimes
Did the children complete all of the activities on the homework tasks?	Mostly	Mostly
Did the 'teacher instructions' assist you with your expectations of the homework activities?	Always	Sometimes
Did you complete the teacher questions at the bottom of the teacher instructions sheet?	Rarely	Rarely
How many of the children handed in their homework tasks each week?	Most	Most
What do you think is the best way to store the homework sheets for the students?	Booklet	Folder
With which year levels do you think this intervention would be most effective?	7/8	7/8
What length of time do you believe would be best for a unit like this to be included in your teaching program?	4-5wks	7-8wks

Note: T1 – Intervention teacher 1

T2 – Intervention teacher 2

The following are responses to the open questions:

Question: Are there any other ideas for activities that you can think of that we did not do?

Teacher 1: *Anything that gets parents to stop busy lives and interact with their kids in a positive way is terrific. You could get kids to interview parents about the activity they were involved in as kids and how this changed as they grew older and why.*

Teacher 2: *Would recommend more 'activities' (making, doing, drawing, mapping, creating PowerPoints, making posters etc) with fewer question/answer tasks as children of their age tend to be more engaged and motivated with these if processing the information by representing in another form.*

Question: What were some of the best reflection activities?

Teacher 1: *Discussion – comparison of results.*

Teacher 2: *Once again, the more activity-based tasks were good to share (eg., mapping, graphs), early on while it was still loosely connected to our topic, we were graphing daily results, in maths which was good.*

Question: What were some of the least enjoyable reflection activities?

Teacher 1: *The most difficult part was chasing up lost sheets/pedometers and overdue tasks but it mostly ran quite independently only requiring brief intro and follow up discussion. TIME is our biggest issue.*

Teacher 2: *After the first couple of weeks, just sharing the answers to parent's questions wasn't too exciting, as they were fairly similar.*

Question: Was there anything you would add or remove from the teacher instruction sheets to make it easier for you to explain the activities to the students?

Teacher 1: *No. It is important that we keep parents up to date (email) as to the goals of the project as it progresses to also keep them motivated.*

Teacher 2: *No, they were quite good to look back at, if unsure, but like the children's activities, would be better if in a booklet, so easier to keep track of and refer back to.*

Question: Do you feel that you had all of the information you needed about the project to deliver it effectively to the students? Please explain.

Teacher 1: *Yes*

Teacher 2: *Yes, but out of context, as it was over the end of one term, beginning of the next, so not relevant to what they are doing in class, so will have been a lot less effective than it could have been. I wouldn't do it over two terms with a primary class, as topics are always contained within a term and a lot of their energy is lost over holidays and isn't/wouldn't be relevant to the topic in at least one of the terms. If started during the term with a related topic, would be ok then, but when 2nd block happens after holiday isn't relevant to that new topic, necessarily, as unlike in secondary schools, in primary most of the teaching is done through integrated curriculum topics.*

Question: Do you think a training session focussed on the delivery of the program would have been beneficial?

Teacher 1: *Yes*

Teacher 2: *I think it would be good if it was planned within the context of classroom activities/topic, rather than just homework activities.*

Question: Do you think it was a problem that the program was in place over the holiday period?

Teacher 1: *Yes*

Teacher 2: *Yes! Also, many families went away for the 3 week break and it wasn't easy to do then.*

Question: Did the activities fit within the 5/6 curriculum and VELS standards? Please explain

Teacher 1: *It fitted with our healthy lifestyle theme but got pushed aside in 4th term.*

Teacher 2: *It would fit within a unit like our balanced lifestyle/healthy choices one, but only if in the one term and not too long, so that their attitudes are still of interest and excitement.*

Question: Do you think 2 homework tasks per week is appropriate for this age class? Explain

Teacher 1: *Yes, quite manageable for this age.*

Teacher 2: *One, even if it was one larger one, as most primary 5/6 classes/teachers give homework out once a week/ have more extended tasks across 1 week – 2 tasks fiddlier. Booklet would be easier to keep track of.*

Question: Would you prefer a booklet of activities that you could select from according to the curriculum rather than giving out the homework in a particular order each week?

Teacher 1: *Great idea.*

Teacher 2: *Yes*

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

This study investigated the effect of a school-based intervention to alter the physical activity behaviours of children and their paternal parents. As this study is an exploratory project for a larger study, a process evaluation was also undertaken. In this chapter the findings of these studies are discussed and compared to other related investigations.

Discussion

STUDY 1

Paternal Parents

Two research questions were developed for study 1. The first question was designed to investigate if children can be educated through a school-based cross-curricular intervention to increase paternal physical activity behaviour. It is important to note that the mean results for paternal parents for both weekend and weekday pre-test data are comparable to other studies. Brisson and Tudor-Locke (2004) list the following recommendations for steps per day for healthy adults: 5,000 steps per day is classified as sedentary; 5,000-7,499 is low active; 7,500-9,999 somewhat active; 10,000 active and 12,500 highly active. The authors state that these categories can identify physical activity levels and assess progress during an intervention.

In the pre-testing for this study weekend steps per day for paternal parents in both class combined averaged 8,156. Weekday steps per day for paternal parents averaged 8,149. In a review of 32 studies on pedometer use in physical activity research, Tudor-Locke and Myers (2001) suggest we should expect healthy younger adults to take between 7,000 and 13,000 steps per day and healthy older adults (over 60-years) to take between 6,000 and 8,500. Tudor-Locke et al. (2001) suggest that between 5,285 and 9,356 steps per day should be considered moderate level of activity. Results from the

paternal parents in this study fit within these values and suggest we have a normal population. Further, data from a number of pedometer-based studies have also demonstrated similar results. Schneider, Crouter & Bassett (2004) studied pedometer values of 10-males aged approximately 40-years over 24-hours and found participants took on average 9,244 steps per day. Tudor-Locke et al. (2004c) found that over a 1-week period 76 males aged on average 48-years took a mean number of 7,192 steps per day. Tudor-Locke et al. (2001) measured 41 males with an average age of 45-years over a 21-day period and found mean steps per day of 7,370. It should be noted however, that these studies did not differentiate between weekday and weekend days. Tudor-Locke et al. (2004a) monitored steps per day over a 1-year period. The 23 participants aged on average 38-years had mean daily steps of 10,082. This study separated weekday and weekend steps and found that on average participants took more steps on weekdays compared to weekends (10,479 versus 9,091). In a study by Tudor-Locke, Burkett, Reis, Ainsworth, Macera & Wilson (2005), investigating average step values, Sundays had the lowest for males, with 5,104 steps on Sunday compared to the highest day Thursday with 6,757 steps. In another study into average steps per day for adults, Tudor-Locke et al. (2004c) also found that Sunday was the least active day.

In this study, data analysis demonstrated a significant difference between pre-test and post-test steps per day on weekends for paternal parents in both intervention and control class combined ($p<.000$). The total steps per day increased by 650 from pre- to post-test. When separated into two groups, the intervention group contributed overall with an increase of 1,179 steps from pre-test to post-test, whereas the control group decreased by 202 steps. Similar increases for intervention group steps have been seen in other studies. A meta-analysis by Richardson et al. (2008) on nine pedometer-based walking studies found average steps per day increases varied between approximately

2,000 and 4,000. It should be noted that this study found slightly greater increases than the 'Walk your Dad' study. A possible explanation for this is that the median duration of the interventions was 16-weeks and ranged from 4-weeks to 1-year in length. In addition, majority of the adults in the studies were women (73%). Bravata et al. (2007) conducted a meta-analysis on 26 pedometer-based studies and found that overall, pedometer users increased their physical activity by 26.9% over pre-test, which equated to over 2,000 to 2,500 steps per day. De Cocker, De Bourdeaudhuij, Brown & Cardon (2008) also showed similar pedometer steps per day on weekends in the intervention class at pre-test of 9,475 during a 12-month multi-strategy community based intervention for 440 adults (approx. 50% males) aged 25 to 75-years. At post, steps per day on weekends were 10,276, an increase of 801. The control class steps per day decreased by 236 steps, similar to the control class in the 'Walk your Dad' study.

For weekday data, analysis showed a significant difference between the intervention and control group at post-test (p=.05). The intervention group steps per day increased by 92. The control group steps per day decreased by 610. This is slightly different to other studies. However, Baker, Gray, Wright, Fitzsimmons, Nimmo, Lowry, and Mutrie (2008) also found significant differences between the intervention and control group mean steps per day in a 12-week pedometer based walking program on 16-men aged on average 49-years. Steps per day for the intervention class were 6,802 at pre-test and 9,977 at post-test. The control class steps per day at pre-test were 6,924 and at post-test 7,078. These results however were not treated separately for weekend and weekday data. De Cocker et al. (2008) found on weekdays that participants in the intervention class increased steps per day significantly from 9,845 to 10,762, an increase of 917 and the control class decreased from 9,824 to 9,673, a decrease of only 151 steps. This is similar to the results in this study and the significant effect of the intervention on weekday steps

suggests a similar positive effect of pedometer-based intervention programs on weekday steps.

In summary, the intervention appears to have a protective effect on weekday physical activity as it prevented steps per day from decreasing as occurred among the control group. Possible reasons for this protective effect could be that paternal parents increased their activity with their children on weekdays, or possibly by adopting some of the strategies covered in the program about how to include more walking into their day.

Children

The second research question was designed to investigate if physical activity behaviour of children altered after undertaking a school-based cross-curricular intervention designed to increase their paternal parents' physical activity behaviours. As per the paternal parents data it is important to note that the pre-test data for children are comparable to data from other studies. Brisson and Tudor-Locke (2004) state that the categories (mentioned previously) for healthy adult steps per day per day are too low for children and that they should be taking 12,500 to 15,000 steps per day. In this study pre-test weekend steps per day for all children combined averaged 8,158 steps per day and on weekdays 11,593 steps per day. Clearly, children in this population take a greater amount of steps on weekdays compared to weekends. In a study by Rowe et al. (2004), 299 children aged 10 to 14-years were found to have weekend steps per day of 9,005 and weekday steps per day of 9,504. Sundays had the lowest steps and Friday the highest.

Data analysis demonstrated a significant difference between pre-test and post-test steps per day on weekends for all children combined ($p<.000$). Total steps increased significantly by 1,232 from pre-test to post-test. Noteworthy is that the intervention group increased by 2,070 steps per day while the control group decreased by 351 steps. The intervention class appears to have contributed to the overall increase and therefore

the difference from pre-test to post-test. This is similar to results from Schofield, Mummery and Schofield (2005) who found a significant increase in steps per day after a 12-week physical activity program from pre-test to post-test with an intervention group increase of 2,747 steps contrasted with a control group increase of 156 steps.

Weekend steps per day between boys and girls were significantly different ($p<.000$). From pre-test to post-test the boys total (intervention and control) increased by 1,973 steps per day and the girls increased by 432 steps per day. Therefore, boys increased steps per day significantly more than girls. At post-test the boys combined (intervention and control) total was 10,591 steps per day and the girls total was 8,092 steps per day. Data from Cox et al. (2006) also showed significant differences between boys and girls steps per day. They studied the physical activity habits of children aged 5 to 11-years and found boys daily steps per day were 15,606 which was significantly higher than girls at 13,031. However, it should be noted that this study only assessed weekday steps per day and therefore steps are higher than in the 'Walk your Dad' study possibly due to increased activity of children on weekdays as also shown in the 'Walk your Dad' study. Data from the 2007 Australian National Children's Nutrition and Physical Activity Survey showed Australian children aged 9 to 13-years took 12,961 steps per day and 10,875 steps per day for boys and girls respectively (Department of Health and Ageing 2007), providing further support for the outcomes of this study. Vincent et al. (2003) also found that 563 Australian children aged 6 to-12 years took steps ranging from 13,864 to 15,023 for boys and 11,221 to 12,322 for girls.

There was a significant difference for steps per day on weekends between boys and girls and the intervention and control groups ($p=.01$). The intervention boys increased 2,598 steps per day and control boys increased 912 steps per day, where as intervention girls increased 1,542 steps per day. The control girls decreased 1,930 steps per day. The

difference appears to be between the intervention group boy's increase and the control group girl's decrease. Similar increases in steps per day were shown in a study by Lubans, Morgan, Callister and Collins (2008) in a school-based intervention to increase physical activity in students aged approximately 14-years. Their results showed an increase of 852 steps per day for intervention group boys, compared to a decrease for control group boys of 2,077 steps per day and for girls an increase of 1,333 steps per day in the intervention group and a decrease of 2,430 steps per day in the control group.

Weekday data analysis revealed a significant difference at post-test between participants in the intervention and control groups (p=01). The intervention group increased by 668 steps per day while the control group decreased by 796 steps per day. Most notably the girls in the intervention group increased by 1,391 steps per day and the control group girls decreased by 580 steps per day, whereas the boys intervention group decreased by 57 steps per day and the control group decreased by 971 steps per day. These results are similar to a study from Horne, Hardman, Lowe and Rowlands (2007) who conducted a 14-week pedometer based intervention on children aged 9 to 11-years. Their results showed a significant increase in girls' steps per day from pre-test to follow up in the intervention group compared to the control group. Whereas there were no significant differences in intervention group boys steps per day from pre-test to follow up compared to the control group. It is also important to note that the steps per day were recorded over weekdays only.

In summary, weekend steps increased for boys and girls in the intervention group and boys in the control group, but not girls. For pre- to post-test averages, the intervention group contributed to the overall effect of a pre- to post-test increase. The intervention group boys increased more than the control group boys, suggesting there was a combined effect occurring for the intervention group boys (intervention plus season)

but a single effect for control group boys (season). Previous research has also highlighted a seasonal effect on children's activity levels where control groups have increased in steps per day, but intervention groups have had a significantly higher increase (Horne et al. 2007). The introduction of daylight saving and change of season from winter for pre-testing to spring for post-testing may have caused the control group increase. For girls in the intervention group, it appears the effect of the intervention was able to offset the negative effect of the season (control group girls decrease). On weekdays the intervention group average increased at post compared to control. Boys had a slight decrease, but the intervention girls increased. It appears that this intervention may be more effective for girls during the week. Possible reasons for this may include girls being more studious at an upper Primary level and, given that the program was homework activity based, girls may have had more affinity for the intervention and been influenced more positively than boys. It should also be noted that the intervention group paternal parents had a significant increase in steps on weekdays, which may suggest that the daughters influenced their paternal parents to undertake more physical activity. This effect may have occurred during the working day independent of the presence of the child, or it may have occurred after the paternal parents arrived home from home from work as a family or father-daughter activity.

Intervention

The 'Walk your Dad' intervention ran for 12-weeks and demonstrated significant increases in steps per day among participants. Other interventions have been implemented for differing lengths of time and have also shown increases in physical activity. Horne et al. (2007) implemented their intervention over just a 2-week period and at 12-weeks of follow up found significant increases in steps per day. It should be noted however that in that study a maintenance period from weeks 3 to 14 was

implemented and aimed to support participants in maintaining their increased physical activity levels. Schofield, Mummery and Schofield (2005) implemented their intervention over a 12-week period and showed significant increases in physical activity. Lubans et al. (2008) conducted their intervention over a 6-month period and showed similar significant increases in children's steps per day per day as interventions lasting just 2-weeks. A pedometer-based intervention on adults of 8-weeks duration demonstrated significant increases in adult steps per day (Croteau, 2004), as did other pedometer-based interventions by Tudor-Locke et al. (2004b) over 16-weeks and De Cocker et al. (2008) over a 12-month period. It is important to note that many studies have been conducted with adults using pedometers to increase physical activity; however, none have used children as the intervention catalyst.

STUDY 2

Process Evaluation

The process involved in delivering this intervention was evaluated to determine relevance and acceptability. The two teachers involved in the intervention group (each responsible for a separate class) completed surveys upon completion of the 12-week intervention. The results of the teachers' survey found that both teachers felt that this program would be more suitable to students in year 7/8 and of a shorter time frame, preferably over just one term (10-weeks).

The teacher instruction sheets were appropriate for delivering the program; however the teacher questions were rarely completed. In relation to this both teachers said they contained enough information, although one teacher added 'Would be better if in a booklet, so easier to keep track of and refer back to.'

The homework activities were easy to explain and were mostly appropriate for the students' age. However, the homework activities were not always appropriate for the

parents and the teachers disagreed to what extent. The children generally completed the homework activities, but there was not always time in class to reflect on them. The homework activities were sometimes enjoyable for the children; however, the teachers disagreed on parent enjoyment of the activities.

The open questions reflected on what the teachers liked and didn't like about delivering the program and suggestions for improvements. A summary of selected items are presented below.

When asked if there are any other ideas for homework activities, one teacher stated 'You could get kids to interview parents about the activity they were involved in as kids and how this changed as they grew older and why.' The other teacher stated 'Would recommend more activities making, doing, drawing, mapping, creating PowerPoint's, making posters etc, with fewer questions/answer tasks.' Teachers were asked to describe some of the best reflection activities. One teacher stated 'The more activity-based tasks were good to share (eg mapping, graphs).' The least enjoyable reflection activities were described by one teacher as 'Just sharing the answers to parent's questions wasn't too exciting, as they were fairly similar.' These results emphasise the need to make the homework activities more creative and active, rather than simply short answer questions for parents.

Both teachers agreed that they had all of the information they needed about the project to deliver it effectively, although one of the teachers thought a training session focused on the delivery of the program would have been beneficial. In a study by Gibson, et al. (2008) process evaluation surveys completed by teachers implementing a school-based intervention found that a training session was very helpful and they would recommend the workshop training session prior to implementing the intervention. Both teachers in the 'Walk your Dad' study thought that the intervention running over the

holiday period was an issue for the program. One teacher stated 'A lot of their energy is lost over holidays and (the intervention) isn't/wouldn't be relevant to the topic in at least one of the terms.' The teacher also stated that 'many families went away for the 3-week break and it wasn't easy to do then.' These results correspond with the suggested length of the intervention being just one-term (10-weeks) and may account for the teacher's viewpoint about the best length of time for the program.

When asked if the activities fitted within the current curriculum, both teachers said a health unit would be suitable to run the program in, however, one teacher stated that it 'Got pushed aside in fourth term' and the other teacher stated 'Only in the one term and not too long.' This is similar to another school-based intervention, the Trial of Activity for Adolescent Girls (TAAG), which developed and tested a school- and community-based intervention to prevent the decline in physical activity in middle school girls. Teachers in this study also found it difficult to implement the intervention fully due to competing priorities within the curriculum (Young, Steckler, Cohen, Pratt, Felton, Moe, et al., 2008). Both teachers in this study agreed that a booklet of activities to select from according to the curriculum would be preferential.

When asked if two homework activities per week were appropriate the teachers disagreed, with one teacher stating it was 'Quite manageable for this age,' while the other teacher thought one larger activity per week was more appropriate as that is usually what occurs at this year level.

Conclusions

STUDY 1

During the period of the research, and among this group of children and their paternal parents, the data reveals the intervention significantly increased weekend step behaviour of girls and weekday step behaviour of girls, boys, and their paternal parent.

STUDY 2

The process evaluation revealed some aspects of the program may require modification. Major recommendations include the following: 12-weeks may be too long to sustain interest; homework activities may need to be tailored more for the appropriateness of the parents' age and contain more activities; grade 5/6 students may not be the best year level for the program; the program running over the holiday period was thought to be disadvantageous; and alignment into the current curriculum (appropriate units) was difficult and alignment with a Health Education unit of study was thought more appropriate.

Recommendations for further study

Based on this research, in the future further studies should investigate the effects of children's advocacy on parental participation in physical activity. The present study demonstrated significant changes in physical activity of parents after their children had participated in a school-based intervention. While the effect of parent's on children's health behaviours has been well documented (Hopper, et al. 1996), there is a lack of research into the possibility that children can influence their parents' health behaviour, and the results of this study give impetus to the further exploration of that phenomena.

The completion of the present study has also revealed a number of issues that should be investigated. Among these issues include compliance with objective measures of physical activity. Research to address the reasons why some participants complied with all aspects of testing and why others didn't is required. It is possible that the participants who complied with testing are more likely to comply with all aspects of the intervention program and therefore show greater effects.

Another issue is the limited study population for the sample. All participants were from one school in Melbourne and were of middle-class socioeconomic status. Given

that the present study is an exploratory study and significant effects of the intervention were seen, a larger population study with more schools and teachers should be conducted. It would be beneficial to implement this program to participants with differing socioeconomic status to assess the effects on the wider community. Taylor, Baranowski and Sallis (2004) suggests that affluent parents have higher expectations or involvement with physical activity compared with less affluent parents. Further studies would benefit from randomisation of class, as the present study assigned the classes to condition, which is a weakness in this study.

The length of time for a program to be effective is also an issue requiring further research. With such varying lengths of time in the literature it would be beneficial to determine what length of time is required to see an intervention effect lasting after follow up has been completed. Therefore, long term follow up is also necessary to demonstrate effectiveness of the program over the longer term and if intervention effects remain.

Research to address the effects of seasonal changes on physical activity is required. In the present study the response from the control class highlights that the season may have an effect on participants. Community and school sport seasons may also have an effect and should be investigated as a possible confounding factor. According to Sallis, et al. (1992) research into the effects of availability of parks and walking tracks and other community resources on participation in an intervention such as this one would also be beneficial.

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Appendix A: RMIT Ethics Approval

4th July 2005

Julie Anthony
1/10 Leicester Street
Heidelberg Heights VIC 3081

Dear Julie,

SETAPP 09 – 05 ANTHONY Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study

Thank you for submitting your amended application for review.

I am pleased to inform you that the committee has approved your application for a period of **6 months** to **January 2006** and your research may now proceed.

The committee would like to remind you that annual reports are due during December for all research projects that have been approved by the Human Research Ethics Sub-Committee.

The necessary form can be found at:
http://www.rmit.edu.au/rd/hrec

Yours faithfully,

Dr Barbara Polus,
Chair, Science, Engineering & Technology Portfolio
HREC Sub-committee (Biomedical)

cc: Jeff Walkley
Amanda Telford
Anthony Welch

Appendix B: Eltham College of Education Approval Letter

ELTHAM

College of Education

1660 Main Road Research
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Victoria 3095 Australia

Telephone (03) 9437 1421
Facsimile (03) 9437 1003
info@elthamcollege.vic.edu.au
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ABN 3100 4992 750

11 May 2004

To whom it may concern

Ms Julie Anthony is employed on a full-time basis as Sports Administrator at ELTHAM College of Education. The College is most supportive of its staff undertaking further studies. Consequently, I am pleased to support Julie in her Masters of Applied Science by allowing her to utilise the College facilities, resources and staff as necessary.

Yours sincerely

Greg King

Executive Director (Human Resources & Teaching)

Appendix C: Child and Parent Information Letters

RMIT UNIVERSITY

Division of Exercise Sciences

School of Medical Sciences
SET Portfolio

Bundoora Campus
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Victoria Australia

Tel +61 3 9925 7076
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http://www.rmit.edu.au/medical-sciences

Walk your Dad - Information Letter
(Plain Language Statement)

Project Title: Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study.

Dear Parent/Guardian,

I am writing to seek your permission to allow your child to participate in a study that will examine children's influence on parental physical activity. This study is being conducted as part of a Master of Applied Science (Human Movement) degree at RMIT University with the support of Eltham College of Education.

Children in grade 5 & 6 at Eltham College of Education are being invited to participate. This school and home-based intervention will be used to determine whether children have an influence on their parent's physical activity behaviour as well as concurrently increasing their own level of physical activity. Lack of physical activity has been associated with the onset of lifestyle diseases such as obesity, diabetes, high blood pressure and heart disease. Findings from this study will inform the development of programs designed to improve the health of our community through the education of children.

If you agree to allow your child to participate in this study they will be asked to complete a physical activity survey at the beginning, twice during and at the end of the study. The survey will contain questions relating to the amount of physical activity and the types of physical activity they do. Your child will also be asked to wear a small motion detector (pedometer) throughout the day for a period of 8 days prior to and on completion of the study, as well as several days during the study. The pedometers are very small, lightweight and can be worn either under or over clothes. Your child will receive instructions on the wear and care of the pedometers.

Classes will be randomly placed into an intervention class or a comparison class. Two classes will receive an educational program, which will be integrated into areas of study including maths, science and technology. One class will continue with their normal areas of study. The program will contain information on physical activities that are recommended by the National Physical Activity guidelines for children and adults. Your child will not be asked to perform any activities that are not recommended within these guidelines. The child's paternal parent (Dad/Male carer/Guardian) will also be asked to participate in this study. He will be asked to complete the physical activity surveys and wear the pedometers when the child does. If the paternal parent does not live with the child, then another adult male from the household (step-dad, grandfather or adult brother) is welcome to participate. The maternal parent (Mother/Female carer/Guardian) can

participate if a male cannot be involved. Children who are not in the class that participates in the education program will receive the program at the conclusion of the study.

All information collected during this study will be kept strictly confidential. Results of the study will be reported to both participant's families and Eltham College of Education in late 2005 or early 2006. Your child will not be personally identified in any report, publication or presentation that arises from this study. Information collected during this study will be kept for a period of 5 years. Please feel free to contact me if you wish to access your child's information at any time during or at the conclusion of this study.

If you wish to support your child's participation and participate yourself, in this study, please complete and return the attached forms (consent, physical activity readiness and physical activity survey) to the school. For your child to be included in this study we must have your signed consent and we have to be sure it is safe for both you and your child to participate by asking you to complete the parent and child physical activity readiness questionnaires. If we think it will not be safe, we will tell you and we may need to ask another household member to take part or we may need to find other activities for your child to do in the study. You and your child are free to withdraw from the study at any time without any consequence. If you or your child choose to withdraw from the study, your child will still be included in school-based activities like their classmates. Please contact either the school or myself if this occurs.

Thanking you in anticipation.

Yours sincerely,

Julie Anthony (for Assoc. Prof. Jeff Walkley and Dr. Amanda Telford)

Contact details:

Miss Julie Anthony:
BH: 9437 1421 AH: 0409 172 846

Associate Professor Jeff Walkley:
BH: 9925 7359

Dr. Amanda Telford:
BH: 9925 7677

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Child Information Letter
(Plain Language Statement)

Project Title: 'Walk your Dad'

Dear Student,

We would like you to help us find encourage their parents to be adults forget that being active is lots of fun. It is also very good for them and will help make them healthy and strong.

You will get to wear a special little computer for a few weeks called a 'pedometer'. It is about one- third of the size of a mobile phone and counts how many steps you take each day. You wear it on your hip from the time you get up in the morning until you go to bed at night.

You also get to fill in surveys to tell me all of the fun activities you do.

We would like you to ask your Dad to also wear a pedometer and fill out the surveys. If your Dad doesn't live with you, then please ask another male that lives in your house. If there are no other males then you can ask a female. Maybe your Mum?

We need you to answer each of the questions on the child physical activity readiness questionnaire to check if it is safe for you to participate. If we think it will not be safe we will tell you about this and find other things for you to do in the study. You can withdraw at any time and you don't have to participate if you don't want to.

Thank you for helping!

Julie Anthony (for Assoc. Prof. Jeff Walkley and Dr. Amanda Telford)

Appendix D: Informed Consent forms for Parent and Child

RMIT UNIVERSITY

Division of Exercise Sciences

School of Medical Sciences
SET Portfolio

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Tel +61 3 9925 7076
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HREC Form No 2b

RMIT HUMAN RESEARCH ETHICS COMMITTEE

Prescribed Consent Form For Persons Participating In Research Projects Involving Questionnaires

PORTFOLIO OF	**Science, Engineering and Technology**		
SCHOOL OF	**Medical Sciences**		
Name of participant:			
	(Print name of adult participant)		
Project Title:	**Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study.**		
Name(s) of investigators: (1)	**Miss Julie Anthony**	Phone:	**9437 1421**
(2)	**Assoc. Prof. Jeff Walkley**	Phone:	**9925 7359**
(3)	**Dr. Amanda Telford**	Phone:	**9925 7677**

1. I have received a statement explaining the questionnaire involved in this project.

2. I consent to participate in the above project, the particulars of which - including details of the interviews or questionnaires - have been explained to me.

3. I authorise the investigator or his or her assistant to administer a questionnaire.

4. I acknowledge that:

   (a) Having read Plain Language Statement, I agree to the general purpose, methods and demands of the study.
   (b) I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.

(c) The project is for the purpose of research and/or teaching. It may not be of direct benefit to me.

(d) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.

(e) The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to Eltham College of Education. Any information which will identify me will not be used.

Adult Participant's Consent

Name: _____ Date: _____

(Participant)

Name: _____ Date: _____

(Witness to signature)

Participants should be given a photocopy of this consent form after it has been signed.

Any complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745.
Details of the complaints procedure are available from the above address.

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HREC Form No 2b

RMIT HUMAN RESEARCH ETHICS COMMITTEE

Prescribed Consent Form For Persons Participating In Research Projects Involving Questionnaires

PORTFOLIO OF	**Science, Engineering and Technology**		
SCHOOL OF	**Medical Sciences**		
Name of participant:			
	(Print name of child)		
Project Title:	**Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study.**		
Name(s) of investigators: (1)	**Miss Julie Anthony**	Phone:	**9437 1421**
(2)	**Assoc. Prof. Jeff Walkley**	Phone:	**9925 7359**
(3)	**Dr. Amanda Telford**	Phone:	**9925 7677**

1. I have received a statement explaining the questionnaire involved in this project.

2. I consent to participate in the above project, the particulars of which - including details of the interviews or questionnaires - have been explained to me.

3. I authorise the investigator or his or her assistant to administer a questionnaire.

4. I acknowledge that:

   (f) Having read Plain Language Statement, I agree to the general purpose, methods and demands of the study.
   (g) I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.
   (h) The project is for the purpose of research and/or teaching. It may not be of direct benefit to me.
   (i) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.

(j) The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to Eltham College of Education. Any information which will identify me will not be used.

Where participant is under 18 years of age (Parent/Guardian Consent):

I consent to the participation of _____ in the above project.

Signature: (1) _____ Date: _____

(Signature of parent / guardian)

Name: _____ Date: _____

(Witness to signature)

Participants should be given a photocopy of this consent form after it has been signed.

Any complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745.

Details of the complaints procedure are available from the above address.

Appendix E: Child and Parent Physical Activity Readiness Questionnaire

Child Physical Activity Readiness

QUESTIONNAIRE (To be completed by Parent/Guardian)

Project Title: Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study.

In order for your child to be eligible to participate in this project the completion of the following questionnaire is required. The questionnaire is designed to assess your child's risk of having an adverse health event during physical activity. ***This questionnaire must be completed by Parent/Guardian.***

Name of Child participant: _____

Name of Parent/Guardian: _____

Date:_____ Date of Birth of Child:_____

Age of Child: _____years Gender of the child:_____

Give a brief description of your child's average activity pattern in the past 2 months:

_____

_____

Circle the appropriate response to the following questions.

1.	Is your child overweight?	Yes	No	Don't know
2.	Does your child smoke?	Yes	No	Social
3.	Does your family have a history of cardiovascular problems (e.g., heart attack, stroke)?	Yes	No	Don't Know
4.	Is your child an asthmatic	Yes	No	Don't Know
5.	Is your child a diabetic?	Yes	No	Don't Know
6.	Does your child have a high blood cholesterol level?	Yes	No	Don't Know
7.	Does your child have high blood pressure?	Yes	No	Don't Know
8.	Does your child have a known heart problem, for example a heart murmur or arrhythmia?	Yes	No	Don't Know
9.	Is your child on any medication?	Yes	No	
	If so, what is the medication? _____			
10.	Do you think your child has any medical complaint or any other reason that you know of or which you think may prevent your child from participating in physical activity?			
	No Yes, please elaborate _____			
11.	Does your child participate in school physical education and/or sport without any restrictions?			
		Yes	No	Don't Know

Name:

Date: _____

(Name of Parent/Guardian)

Signature: Date: _____

(*Signature of Parent/Guardian)*

Parent Physical Activity Readiness

QUESTIONNAIRE (To be completed by participating Parent/Guardian)

Project Title: Increasing parental physical activity via children's advocacy: The 'Walk your Dad' study.

In order to be eligible to participate in this project the completion of the following questionnaire is required. The questionnaire is designed to assess your risk of having an adverse health event during physical activity.

Please ensure that this form is completed under the guidance of a parent/ legal guardian.

Name of Parent participant: _____
Date:_____

Name of Child participant: _____

Date of Birth of Parent:_____

Gender of the parents _____ Age: _____years

Give a brief description of your average activity pattern in the past 2 months:
_____
_____
_____

Circle the appropriate response to the following questions.

1.	Are you overweight?	Yes	No	Don't know
2.	Do you smoke?	Yes	No	Social
3.	Does your family have a history of cardiovascular problems (e.g., heart attack, stroke)?	Yes	No	Don't Know
4.	Are you an asthmatic	Yes	No	Don't Know
5.	Are you a diabetic?	Yes	No	Don't Know
6.	Do you have a high blood cholesterol level?	Yes	No	Don't Know
7.	Do you have high blood pressure?	Yes	No	Don't Know
8.	Do you have a known heart problem, for example a heart murmur or arrhythmia?	Yes	No	Don't Know
9.	Are you on any medication?	Yes	No	
	If so, what is the medication? _____			
10.	Do you think you have any medical complaint or any other reason that you know of or which you think may prevent you from participating in physical activity?			
	No Yes, please elaborate _____			

Name: _____ Date: _____

(Name of Parent/Guardian)

Signature: _____ Date: _____

(*Signature of Parent/Guardian)*

Appendix F: Homework activity sheets

'Work, rest and play'

Pedometer Fun

Homework Activity: *1*

Aim: *The student will teach their parent how to use the pedometer*

Materials: *Pedometers, pen*

ACTIVITIES:

1. Why do you think a pedometer would be a helpful tool for recording steps?

_____
_____

2. Brainstorm ways in which a pedometer might help the following people.

An overweight person:
_____
_____

An active person:
_____
_____

You:

_____
_____

Dad/Pedometer Buddy:

_____
_____

3. Read the instructions on pedometer wear and care - take 10 steps. Check the pedometer to see if it measured your steps correctly. Record your results for 3 attempts:

1 _____ 2 _____ 3 _____

Repeat for your Dad/Pedometer Buddy:

1 _____ 2 _____ 3 _____

5. Put the pedometer in a place you will easily find each morning. List where your pedometers will be kept at night.

Me: _____

Dad/Pedometer Buddy: _____

*Remember, you should wear the pedometer as soon as you can in the morning (even if you are wearing your pyjamas)

REFLECTION:

Did you enjoy this activity? YES / NO

Was it an easy or hard activity for you? EASY / HARD

Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Design, Creativity and Technology Links to VELS: Design, Creativity and Technology Level 4 – producing

‘Work, Rest and Play’

Healthy Steps

Homework Activity: 2

Aim: *The student will brainstorm about their walking habits and the benefits of walking and discuss these with their Dad/Pedometer Buddy.*

Materials: P*en*

ACTIVITIES:

1. What do you think is the most popular physical activity that adults participate in?

_____

2. Think about all of the times that you walk during a school day and list as many examples as you can (e.g., walk to the fridge, walk around the classroom).

_____
_____
_____

3. List some reasons why you think walking is an important activity?

_____
_____
_____
_____

3. Interview your Dad/Pedometer Buddy and list examples of the places they walk during a normal work day.

_____
_____
_____

4. Interview your Dad/Pedometer Buddy and record if they think walking is an important activity and why.

_____
_____
_____

5. Ask your Dad/Pedometer Buddy to help you list the changes that happen to your body when you walk (e.g., what does your heart do?).

_____
_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Science Links to VELS: Science Level 4 – Science, knowledge and understanding

'Work, Rest and Play'

A Walk in the Park

Homework Activity: 3

Aim: *The student will determine his/her Dad/Pedometer Buddy's and their own number of steps each day.*

Materials: *Pedometers, pen*

ACTIVITIES:

1. Where on your body is the pedometer worn?
_____

2. Place the pedometer on your waist and march on the spot for 60 seconds (1min). Record the number of steps for you and your Dad/Pedometer Buddy separately.

My steps _____

Dad/Pedometer Buddy's steps _____

3. Determine how many steps would be taken if the same pace was kept for 1 hour, show your workings
(e.g., 60 steps times by 60(mins) equals 3,600 steps).

My steps _____

Dad/Pedometer Buddy's steps _____

4. Record the number of steps you and your Dad/Pedometer Buddy take each day for a week (remember to wear your pedometer from when you get up in the morning to when you go to bed at night).

	MON	TUES	WED	THUR	FRI	SAT	SUN
ME							
DAD/PEDOMETER BUDDY							

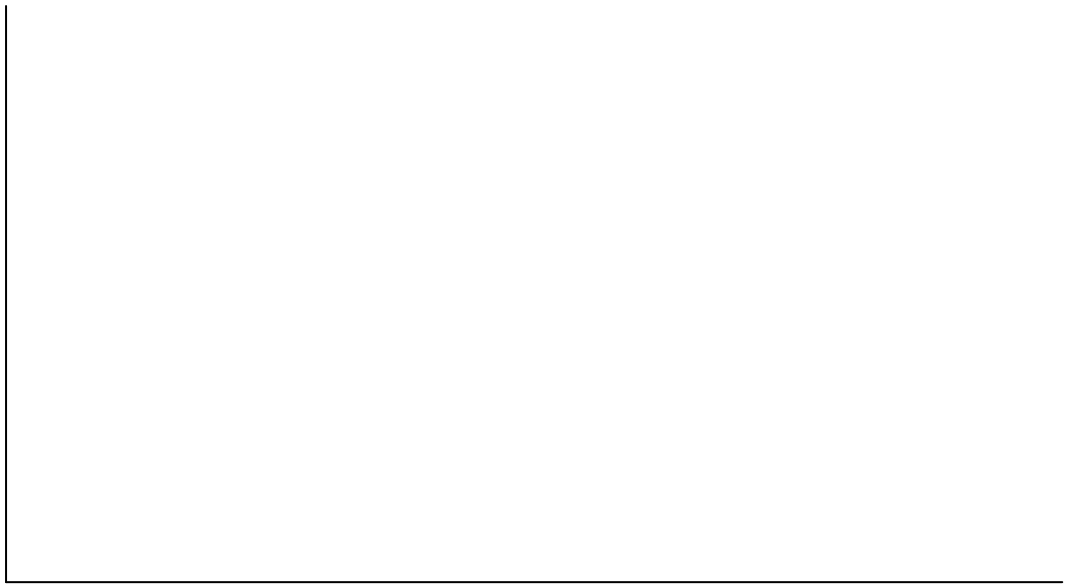
5. Add up your total steps for 1 week

My steps _____

Dad/Pedometer Buddy's steps _____

6. Plot these results as a line graph from Monday to Sunday (draw your steps in one colour and Dad/Pedometer Buddy's in another).

NO. OF STEPS



Mon Tues Wed Thurs Fri Sat Sun

DAYS

7. Who had the highest number of steps? _____

REFLECTION:

Did you enjoy this activity? YES / NO

Was it an easy or hard activity for you? EASY / HARD

Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Mathematics Links to VELS: Mathematics Level 4 – measurement, chance and data

'Work, Rest and Play'

Walk your socks off

Homework Activity: 4

Aim: *Students will identify ways to increase daily steps for themselves and Dad/Pedometer Buddy.*

Materials: *Pedometers, pen*

ACTIVITIES:

It is recommended that adults should walk at least 10,000 steps per day, each day of the week, in order to enhance personal health. The following is the list of classifications of activity according to the number of steps an individual walks per day.

Inactive lifestyle: < 5,000 steps/day
Low active: 5,000 – 7,499 steps/day
Somewhat active: 7,500-9,999 steps/day
Active: > 10,000 steps/day
Highly active: > 12,500 steps/day

1. Should you wear a pedometer during water based activities?
YES / NO

2. Record the number of steps you and your Dad/Pedometer Buddy take in 1 day – choose one average day in the week (remember to wear your pedometer from when you get up in the morning to when you go to bed at night).

My steps _____
Dad/Pedometer Buddy's steps _____

3. Do you meet the requirements for an 'active' person (includes highly active)? (check the number of steps required above)

Me YES / NO
Dad/Pedometer Buddy YES / NO

4. Identify some ways you could increase your daily steps.

_____
_____

5. Identify some ways your Dad/Pedometer Buddy could increase his steps each day.

_____
_____

6. List some activities that you participate in other than walking that would increase your steps per day.

_____
_____

7. List some activities that increase your heart rate, but don't involve walking.

_____
_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 - creativity

'Work, Rest and Play'

Footsteps

Homework Activity: 5
Aim: *Compare active and inactive lifestyles.*
Materials: *Pedometers, pen*

ACTIVITIES:

1. What is the purpose of the safety strap on the pedometer?

_____

2. Complete the table below with physical activities that you are involved in outside of school (e.g., walk the dog).

MON	TUES	WED	THUR
FRI	SAT	SUN	

3. Complete the table below with physical activities that your Dad/Pedometer Buddy is involved in (e.g., household chores).

MON	TUES	WED	THUR
FRI	SAT	SUN	

4. Complete the following table - two examples have been given. Complete the remaining tasks and then come up with others with your Dad/Pedometer Buddy's help.

TASK	ACTIVE (choice)	INACTIVE (choice)
Washing Dishes	Wash in the sink and dry	Put in the dishwasher
Clearing leaves from the path	Sweeping leaves with a broom	Blowing leaves away with a leaf blower
Changing TV channel		

4. Do you think you have an 'active' lifestyle? Why / Why not?

_____
_____

5. Do you think your Dad/Pedometer Buddy has an 'active' lifestyle? Why / Why not?

_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Physical Education/Health
Links to VELS: Health and Physical Education Level 4 – movement and physical activity

'Work, Rest and Play'

Goal Setting

Homework Activity: 6
Aim: *Students will identify goals for themselves and their Dad/Pedometer Buddy to increase steps.*
Materials: *Pedometers, pen*

ACTIVITIES:
Goals have to be measurable, achievable and personal if they are going to make changes in your daily habits.

1. Why do you think it is important to set goals for activity?

_____
_____

2. Record the number of steps taken in one weekday and one weekend day (select any day).

	WEEKDAY	WEEKEND DAY
My Steps		
Dad/Pedometer Buddy's Steps		

3. Set a goal for yourself to increase the number of steps you take per day. Ask your Dad/Pedometer Buddy to set a goal for his/her steps (A common goal is to increase current steps by 10%, eg if 6,000 steps is current steps per day, then the goal should be 6,600 steps)

	WEEKDAY	WEEKEND DAY
My Goal		
Dad/Pedometer Buddy's Goal		

4. How are you going to reach this goal (what can you do differently)?

_____
_____

5. Ask your Dad/Pedometer Buddy how he/she could increase his/her steps to reach his/her goal. Record his/her ideas.

_____
_____

6. Select a weekday and weekend day on which you will try to reach your daily goal. Record your steps.

	WEEKDAY	WEEKEND DAY

My Steps		
Dad/Pedometer Buddy's Steps		

7. Did you reach your goals?

_____
_____

8. Did your Dad/Pedometer Buddy reach his/her goals?

_____
_____

9. Explain why you think you and your Dad/Pedometer Buddy did or did not reach your goals.

You:_____
_____
Dad/Pedometer Buddy:_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 - creativity

'Work, Rest and Play'

Estimating Challenge

Homework Activity: 7

Aim: Students will practice and test their estimating skills with the use of pedometers.

Materials: *Pedometers, pen*

ACTIVITIES:

All of these activities should be done at home.

1. Estimate how many steps it will take to walk each distance below and write it in the space provided. Then, walk the distances and record the exact number of steps the pedometer registers.

A: Estimated steps from front door to kitchen _____
Actual steps _____

B: Estimated steps from couch to refrigerator _____
Actual steps _____

C: Estimated steps from back door to back fence _____
Actual steps _____

D: Estimated steps from loungeroom to bedroom_____
Actual steps _____

E: Estimated steps from driveway to front door_____
Actual steps _____

2. Record the differences between your estimate and the actual steps per day for all of the following (if you guessed it was 100 steps in the back yard and the actual was only 85, the difference would be 15 steps).

A: _____
B: _____
C: _____
D: _____
E: _____

Total difference: _____

3. Ask your Dad/Pedometer Buddy to estimate the same distances for himself and record the actual steps – then work out the difference.

A: Estimate _____ Actual _____ Difference: _____
B: Estimate _____ Actual _____ Difference: _____
C: Estimate _____ Actual _____ Difference: _____
D: Estimate _____ Actual _____ Difference: _____
E: Estimate _____ Actual _____ Difference: _____

Total difference: _____

4. Who had the lowest <u>total</u> number of differences? The lowest number is the best estimator.

_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Mathematics Links to VELS: Mathematics Level 4 – measurement, chance and data. Mathematics Level 4 – working mathematically

'Work, Rest and Play'

Motivation March

Homework Activity: 8
Aim: Student designs a chart for the Dad/Pedometer Buddy to put up in the home to increase motivation for activity.
Materials: *Pedometers, pen*

ACTIVITIES:

1. List some ideas that could be used to motivate someone to increase their physical activity levels.

_____
_____
_____
_____

2. Use the chart on the back of this sheet as a motivational tool to monitor and motivate yourself and your Dad/Pedometer Buddy's activity levels for one week (Put it somewhere you can both see – maybe the fridge).

3. How many days did you reach your goal?

Me: _____
Dad/Pedometer Buddy: _____

4. How many days did you manage 10,000 steps?
Me: _____
Dad/Pedometer Buddy: _____
REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Physical Education/Health Links to VELS: Health and Physical Education Level 4 – movement and physical activity

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________	STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________	STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________	STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________	STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________	STEP GOAL: Me ___________ Pedometer Buddy __________ What activities did I do today? Me: Pedometer Buddy: ACTUAL STEPS: Me ___________ Pedometer Buddy __________

Signatures: Me ____________________ Pedometer Buddy: ____________________

'Work, Rest and Play'

Pedometer persuasion

Homework Activity: 9

Aim: The student uses advocacy strategies to promote walking activities to their Dad/Pedometer Buddy.

Materials: P*en*

ACTIVITIES:

1. List some strategies you could use to remind your Dad/Pedometer Buddy to be physically active everyday.

_____
_____
_____

Try these on your Dad/Pedometer Buddy throughout the week!

Did any of your strategies motivate them to be more active? List any that worked and how. Ask your Dad/Pedometer Buddy if any of them worked.

_____
_____
_____

2. On the back of this sheet design a poster to prompt your Dad/Pedometer Buddy to exercise each day for a week.
(remember to put it in a place he will see it – maybe the fridge).

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: English/Interdisciplinary learning Links to VELS: English Level 4 – Speaking and listening. Communication Level 4 – listening, viewing and responding.

Poster

‘Work, Rest and Play’

Stepping Strategies

Homework Activity: 10

Aim: Student identifies barriers to both their Dad/Pedometer Buddy’s and their own walking and identifies strategies to overcome.

Materials: *Pen*

ACTIVITIES:

1. List some barriers that prevent you from being physically active.

_____
_____
_____
_____

2. What do you think some barriers might be that prevent your Dad/Pedometer Buddy from being physically active?

_____
_____
_____
_____

3. Interview Dad/Pedometer Buddy and find out if they believe there are barriers preventing them from being more physically active – list them.

_____
_____
_____
_____

4. List some ideas for your Dad/Pedometer Buddy so they can overcome barriers to physical activity.

_____
_____
_____
_____

5. Discuss these with your Dad/Pedometer Buddy – can they use the strategies you have identified – please explain.

_____
_____
_____
_____

6. What can you do to overcome your barriers to physical activity?

_____
_____
_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 - creativity

‘Work, Rest and Play’

STEPPING SCENARIOS

Homework Activity: 11

Aim: Student and their Dad/Pedometer Buddy explore scenarios that involve overcoming barriers to physical activity

Materials: *Pedometers, pen*

ACTIVITIES:
Please read the following scenarios and think about how you could be active in each situation.

1. It is pouring rain outside and has been all day. It doesn’t look like stopping.
- How are you going to reach your goal of 10,000 steps today?

Me:_____
_____
_____
Dad/ Pedometer Buddy:_____
_____
_____

2. You get home from work late every night and are too tired after work to do any physical activity.
- How are you going to reach your goal of 10,000 steps each day? (Think about: where you park your car, where you go to get your lunch, what you do on your coffee break, do you take the stairs, etc)

Dad/ Pedometer Buddy:_____
_____
_____

3. You have to look after the kids each night when you get home. All they want to do is watch TV and so do you.
- What physical activities can you do whilst watching your favorite shows? (What can you do in the ad breaks?)
Dad/ Pedometer Buddy:_____
_____
_____
_____

4. You would love to be physically active, but ‘just don’t have time.’
- What sedentary activities could you turn into physical activities? Explain (e.g., reading, TV, emailing, chatting on the phone, spending time with friends)

Me:_____
_____
_____
Dad/ Pedometer Buddy:_____
_____
_____

5. OPTIONAL ACTIVITY
Go to a shopping centre and record how many steps you took whilst walking around the shops.
Me: _____
Dad/Pedometer Buddy: _____
Are you surprised by the amount of steps taken? _____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 - creativity

'Work, Rest and Play'

Tracks and Trails

Homework Activity: 12

Aim: *Students identify walking trails and locations where they can walk in their local community*

Materials: *Melways/Street directory, pen*

ACTIVITIES:

Using a street directory, locate the street that you live in.

1. Are there any walking trails in your local community?
YES / NO (if no go to Q 5)

2. Have you ever used the walking trails?
YES / NO

Why, Why not? _____

3. Has your Dad/Pedometer Buddy ever used the walking trails?
YES / NO

Why, Why not? _____

4. Using the street directory list 5 locations that you could walk to in your local community (e.g., local park, shops).

a. _____
b. _____
c. _____
d. _____
e. _____

5. Study the map of your local area and write directions from your house to the various locations listed above. List the approximate distance according to the map in metres (eg milk bar 500m).

a. _____
_____
_____
b. _____
_____
_____
c. _____
_____
_____
d. _____

_____
_____
e. _____
_____
_____

6. Have you ever walked to any of these locations?
YES / NO
Why, Why not? _____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Mathematics/ Geography Links to VELS: Mathematics Level 4 – space. Geography Level 4 – geospatial skills.

'Work, Rest and Play'

Weekday v Weekend

Homework Activity: 13

Aim: Student analyses the levels of physical activity on weekdays compared to the weekend

Materials: P*en*

ACTIVITIES:

1.

a) List the physical activities you do in an average week from Monday to Friday (include Physical Education classes).

MON	TUES	WED	THUR	FRI

b) List the physical activities you do on an average weekend

SAT	SUN

2. Which day/s of the week are you most active and why?

_____

_____

3.

a) List the physical activities your Dad/Pedometer Buddy does in an average week from Monday to Friday (interview your Dad/Pedometer Buddy).

MON	TUES	WED	THUR	FRI

b) List the physical activities they do on an average weekend

SAT	SUN

2. Which day/s of the week are they most active and why?

_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Physical Education/Health Links to VELS: Health and Physical Education Level 4 – movement and physical activity

'Work, Rest and Play'

Active Transport

Homework Activity: 14

Aim: Student identifies ways to increase walking habits with active transport.

Materials: *Pen*

ACTIVITIES:

1. Circle the activity in each of the following examples that would use more energy.

a) Riding in an elevator / Walking up the stairs

b) Driving to school / walking to school

c) Watching TV / Walking the dog

d) Reading a book / Gardening

e) Parking close to shops / Parking further away

f) Sitting with friends / Walking with friends

g) Talking with Dad(Pedometer Buddy)
/
Walking and talking with Dad(Pedometer Buddy)

2. Interview your Dad/Pedometer Buddy and write down his responses to the following questions.

a) At work (or in other situations) do you take the lift or the stairs? Explain why?

_____
_____

b) Is it possible to park further from work and walk, or get off public transport earlier and walk the remaining distance?

_____
_____

c) Do you do some form of physical activity each day?
YES / NO
Explain:
_____
_____

d) Is it possible to walk for 30 minutes each day for most days of the week? Why / Why not?

_____
_____

e) Can you think of any places that you could walk for transport rather than drive in your local area?

_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 – reasoning, processing and enquiry

'Work, Rest and Play'

Home Homework

Homework Activity: 15

Aim: Student and Dad/Pedometer Buddy brainstorm ways to increase their steps per day with everyday activities.

Materials: *Pedometers, pen*

ACTIVITIES:

1. List some activities that you do everyday around the house that will increase your steps per day (eg vacuuming, gardening).

_____
_____
_____

2. List some other ideas that you can think of that would increase your steps per day everyday around the house.

_____
_____
_____

3. Fill in the table (over the page) each day with only the activities you have done around the house (e.g., vacuuming, gardening, washing the car, walking the dog, etc). Ask Dad/Pedometer Buddy to fill out his table.

Me:

MON	TUES	WED	THUR	FRI	SAT	SUN

Dad/Pedometer Buddy:

MON	TUES	WED	THUR	FRI	SAT	SUN

4. a) Which activities increased your steps per day?

_____
_____
_____

b) Are there any physical activities that didn't increase your steps per day?

_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____(Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 - creativity

'Work, Rest and Play'

Energy input/output

Homework Activity: 16
Aim: Students examine energy input compared to energy output and its effects on weight.
Materials: P*edometer, pen*

ACTIVITIES:

Kilojoules explained:

Food energy is measured in 'kilojoules'. This unit of measurement allows us to talk about how much energy a food contains and how many kilojoules are burned up during a particular exercise. The kilojoule content of foods depends on the amounts of carbohydrates, fats and proteins present in the food. If we regularly eat more kilojoules than our body needs, the excess will be stored as body fat. The more energy you put in (with foods high in kilojoules), the more you need to burn off through physical activity. **from** www.betterhealth.vic.gov.au

1. List 6 physical activities that you participate in that would use up high amounts of energy (kilojoules).

_____
_____
_____

2. List 6 physical activities that your Dad/Pedometer Buddy participates in that would use up high amounts of energy (kilojoules).

_____
_____
_____

3. List 3 activities that you participate in that would use up only small amounts of energy. (e.g., watching TV)

_____
_____
_____

4. List 3 activities that your Dad/Pedometer Buddy participates in that would use up only small amounts of energy. (e.g., watching TV)

_____
_____
_____

5. a) Select one of the following items and circle.
50g Smiths Crinkle chips – 1119kj
60g Cadbury Boost Bar – 1254kj

600ml SOLO – 1272kj

Listed next to each food is the amount of kilojoules each contains. As a guide, you may burn approximately **270kj per kilometer**. If your stride length is 1m, calculate how many steps you will need to take to burn off the energy in the food you selected. (e.g.,1000kj / 270 = 3.7km x 1000 steps (3700 steps))

_____

b) Repeat the question above for the following items
50g Packet of sultanas – 670kj
Muesli bar – 830kj
600ml orange juice – 960kj
(record the steps needed)_____

c) Plan an activity for 1 hour. See if you and your Dad/Pedometer Buddy can take enough steps to burn off the foods in Q5.

Were you successful?		Were they successful?	
a:	YES / NO	a:	YES / NO
b:	YES / NO	b:	YES / NO

5. Compare the time taken to burn off the 2 foods. Please discuss your observations and explain why 1 food took longer to burn off.

_____
_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Physical Education/Health/Science Links to VELS: Health and Physical Education Level 4 – Health knowledge and promotion. Science Level 4 – Science, knowledge and understanding.

‘Work, Rest and Play’

Letter to the Editor

Homework Activity: 17

Aim: *Student will write a persuasive piece of writing to a newspaper to outline the benefits of physical activity.*

Materials: *Pen*

ACTIVITIES:
Current exercise guidelines encourage us to engage in moderate to vigorous physical activity for at least 30mins most days of the week.

1. List some physical activities that your Dad/Pedometer Buddy could do to reach this activity goal.

_____
_____
_____

The 30mins does not have to be continuous, it could be broken up into 2 x 15min sessions per day or even 3 x 10min sessions.

2. On the back of this sheet write a letter to your local newspaper outlining the benefits of getting dad’s to be physically active.
   You must include the following:
   a) Ideas to reach the physical activity guidelines listed above (include ideas to break up the sessions into shorter bouts)
   b) Why pedometers are a useful tool for physical activity and the impact they can have on people’s activity levels.

To the editor…….

3. Ask your Dad/Pedometer Buddy to read the letter.

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:
_____ (Dad/Pedometer Buddy’s signature)

Subject Area:	English/ Design, Creativity and Technology
Links to VELS:	English Level 4 – writing. Design, Creativity and Technology Level 4 – analyzing and evaluating.

‘Work, Rest and Play’

Active for Life

Homework Activity: 18

Aim: *Students outline the physical, social and mental benefits of maintaining a physically active lifestyle*

Materials: *pen*

ACTIVITIES:

1. List the benefits of a physically activity lifestyle.

a) Physical benefits

_____
_____
_____

b) Social benefits

_____
_____
_____

c) Psychological benefits

_____
_____
_____

2. Sit down with Dad/Pedometer Buddy and plot days and times that you both could incorporate physical activity into your everyday lifestyle (remember the guidelines – at least 30mins most days of moderate to vigorous physical activity).

Mondays:
Me_____
Dad/Pedometer Buddy_____
Tuesdays:
Me_____
Dad/Pedometer Buddy_____
Wednesdays:
Me_____
Dad/Pedometer Buddy_____
Thursdays:
Me_____
Dad/Pedometer Buddy_____
Fridays:

Me_____
Dad/Pedometer Buddy_____
Saturdays:
Me_____
Dad/Pedometer Buddy_____
Sundays:
Me_____
Dad/Pedometer Buddy_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Science Links to VELS: Science Level 4 – Science, knowledge and understanding.

Reflection

Homework Activity: 19
Aim: Student interviews their Dad/Pedometer Buddy about their activity levels, self-efficacy and social support now that the program has ended
Materials: *Pen*

ACTIVITIES:
Ask your Dad/Pedometer Buddy the following questions

1. Did the activities over the last 12 weeks make you think more about the benefits of physical activity? If yes, list what he said

_____
_____
_____

2. Have you been more active over the last 12 weeks than usual? If yes, give examples

_____
_____
_____

3. What physical activities do you enjoy the most and why?

_____
_____
_____

4. Do you think you could continue to be active without prompting by me? Explain

_____
_____

5. Did you enjoy having someone to exercise with? Explain

_____
_____
_____

6. What do you think is the best thing about exercising? Explain

_____
_____
_____

7. Do you think you could incorporate physical activity into your everyday lifestyle?

_____
_____
_____

REFLECTION:
Did you enjoy this activity? YES / NO
Was it an easy or hard activity for you? EASY / HARD
Do you have any comments about this activity?

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interdisciplinary Links to VELS: Thinking Level 4 – reflection, evaluation and metacognition

'Work, Rest and Play'

HOLIDAY HOMEWORK

Aim: Set and attempt to achieve exercise goals for the holidays
Materials: *Pedometers, pen*

ACTIVITIES:

1. Is your family going away over the holidays?
YES / NO

If yes, where are you going?
_____

2. Will you be able to make opportunities to participate in physical activities over the holidays?
YES / NO

3. Discuss with your family the types of physical activity that could be done over the holiday break, while at home or away. List the activities.

_____
_____
_____
_____
_____

4. List the activities that could be done together as a family and individually for both you and your Dad/Pedometer Buddy.
Me:_____
_____

Dad/Pedometer Buddy:_____
_____
_____

As a Family:_____
_____

5. Explain the benefits of working with a team (family) to increase physical activity.

_____
_____
_____

6. Complete the charts for each week of the holidays and include examples of the physical activities that you and your Dad/Pedometer Buddy participate in each day.

REFLECTION:

Did you enjoy this activity?	YES / NO
Was it an easy or hard activity for you?	EASY / HARD
Do you have any comments about this activity?	

Please ask your Dad/Pedometer Buddy to sign here once this sheet is completed:

_____ (Dad/Pedometer Buddy's signature)

Subject Area: Interpersonal development Links to VELS: Interpersonal development Level 4 – working in teams

Week 1:

MON	TUES	WED	THUR	FRI	SAT	SUN
Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:

Week 2:

MON	TUES	WED	THUR	FRI	SAT	SUN
Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:

Week 3:

MON	TUES	WED	THUR	FRI	SAT	SUN
Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:	Me: Pedometer Buddy:

Appendix G: Frequently Asked Questions

TEACHER FAQs

Who is in charge of the project?
Direct contact is Julie Anthony. Supervisors at RMIT are Assoc. Prof. Jeff Walkley and Dr. Amanda Telford.

Why Dad/Pedometer Buddy, not Mum?
Studies have shown that participation in physical activity is declining. Middle-aged males are a class at high risk for lifestyle diseases which are attributable to low levels of physical activity. Statistics show that more males are overweight or obese than females. The aim of the study is to increase the physical activity levels of middle-aged males.

What do students do if they don't have a Dad/Pedometer Buddy at home?
Pick another male in the household if possible, but mum or sister can take part if there is no male.

Who explains the project to the students and their families?
The project supervisors will hand out initial forms for students and parents for consent. Classroom teachers will then be involved with the distribution and collection of homework tasks and classroom reflection.

What if a child or their parent refuses to participate?
They will still take part in the homework and school based reflection activities, but will not have any information collected or analysed by the project supervisors.

How long does the project go for?
It will begin in week 5 of term 3 and go until week 5 of term 4.

Who collects/corrects the homework activity?
Classroom teachers collect the activity and glance over to ensure activites have been completed. Teachers may choose to use the activity for assessment.

What if a student is absent for a period of time?
Student will need to continue with the project when they return and will not need to catch up on missed homework activities.

What if students go away over the holidays?
Students can still perform physical activities and will be given homework tasks that are not compulsory.

What if Dad/Pedometer Buddy has no time?
Students will need to try and get their Dad/Pedometer Buddyinvolved (the aim of the project), but if they won't make time then they may choose another family member to participate.

What if Dad/Pedometer Buddygoes away during the project?
Students will need to choose another family member to complete the activities. But the project supervisors will need to be informed.

What if students lose their activity?
If students are given only one at a time and the rest are kept safe at school, they will only lose one activity and they can complete it again.

What if students lose their pedometers?
This may happen. Please inform supervisors immediately.

What can be done to reduce the chance of loss or damage to a pedometer?
Encourage students to read the pedometer 'wear and care' tip activity. Review this activity with students to promote understanding. Stress the importance of equipment care.

What if students are absent for reflection?
If time, give them a chance to talk with you about the task when they return.

What if we run out of time in the day to do the reflection or hand out the homework tasks?
Try to do this at the start of the day to reduce the chance of this happening.

Appendix H: Teacher Instruction sheets

Teacher Instruction Activity

Activity 1 – Pedometer Fun

Instructions:

- Handout and explain homework activity
- Handout Pedometer 'Wear and Care' information.
- Go through how to wear your pedometer.

FAQs:

What if I lose the pedometer?

Tell the teacher straight away. There's less chance of losing a pedometer if it is worn correctly with the safety clip attached to your clothing. When you take it off to sleep or shower, put it in the same place to help remember where it is.

How do I show my Dad/Pedometer Buddy how to put it on?

Give Dad/Pedometer Buddy the information activity and he can practice.

What if Dad/Pedometer Buddy won't participate?

Ask someone else in the house to participate, but you must let us know.

Will it be graded?

The activities won't be graded themselves, but a chart of progress will be on the wall to help me keep track of who has done the homework activity.

What if I can't get it done because Dad/Pedometer Buddy is away?

Let us know and you can complete it later and hand it in when they get home.

Reflection:

- Ask students why they think the pedometer was invented?
- Do they think it will help them or their Dad/Pedometer Buddy be more active?
- Ask some students to give their ideas on how pedometers could help overweight people and active people
- Ask students if they enjoyed playing with the pedometers and if they think they will be useful for improving their activity levels?

Students submit homework activity at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 2 – Healthy Steps

Instructions:

- Handout and explain homework activity

FAQs:
What if Dad/Pedometer Buddy won't participate?
Ask someone else in the house to participate, but you must let us know.

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Walking is the most popular physical activity for adults
- Ask students to give examples of all of the places they can walk
- Did their fathers see walking as an important activity, why or why not?
- Discuss changes that happen to the body when walking, e.g., sweat, breathing increases, heart rate increases, body warms up.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 3 – A walk in the park

Instructions:

- Handout and explain homework activity
- Review pedometer wear and care with the student (ie. Worn all day, except in water or for contact sports, worn on hip with safety strap attached)

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

What if I forget to wear it one day?
That's ok, just leave that day blank and take the average of the other days and use that for the day missing.

Reflection:

- Students in table class (where they sit) add up totals for their steps on the table. Add all tables together on board to work out total steps in 1 week for whole class. Then, assume each step is 50cm, calculate how many kilometres the class walked in the week.
  - Convert steps into metres (divide by 2) then divide by 1000.
- Repeat for parent totals
  - Who walked further? Parents or students.
- Discuss why some people may have different results, e.g., some parents have active jobs, some students may do water sports or sports where pedometers can't be worn, some people are more active than others.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 4 – Walk your socks off

Instructions:

- Handout and explain homework activity
- Discuss 10,000 steps a day goal – do students think it is possible?
- ROAD SAFETY: Remind students of importance of being safe while walking.

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Discuss the importance of meeting the step requirements for health
- Ask students to give examples of their ideas for increasing their own daily steps per day
- Ask students to give examples of their ideas for increasing their fathers daily steps per day
- Activities that increase HR but don't involve walking
  - Swimming
  - Bike riding
  - Excitement
  - Stress

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 5 – Footsteps

Instructions:

- Handout and explain homework activity
- Review pedometer wear and care
- Discuss what active and inactive means
  - Active adults: 30mins/day of moderate intensity physical activity most days of the week (or 10,000 steps/day)
  - Active children: 60mins/day of moderate intensity physical activity everyday
  - Moderate intensity physical activity can be described as a brisk walk

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:
Equipment – 8-10 pieces of A3 sized paper

- Students in class (3 or 4)) - on an A3 piece of paper, students record the activities that they do during the week. Make it big and bright and they can be posted around the room.
- As a class discuss the activities that Dad/Pedometer Buddy does – call for examples. Include examples of activities that other members of the family do (e.g., Mum, brother/sister, relatives).
- As a class brainstorm ideas for new activities that they could do in the future to become more active.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 6 – Goal Setting

Instructions:

- Handout and explain homework sheet
- Review pedometer wear and care
- Outline the importance of goal setting and realistic goals

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

What if it is raining?
If it is not possible to do the activities due to constant rain, there can be a time extension for the due date on this homework activity.

Reflection:

- Discuss if students were able to reach their goals. Discuss whether even though some may not have reached their goal, did trying to reach it increase the number of daily steps anyway?
  - Remind students that every attempt is a step to successfully achieving their goal.
- Discuss whether goals were achievable/realistic.
- Discuss ideas for how some students were able to increase their activity levels to meet their goals – what did they do? Discuss if Dad/Pedometer Buddy's were able to increase their activity levels to meet their goals.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 7 – Estimating Challenge

Instructions:

- Handout and explain homework sheet
- Show students how to work out the difference between the estimated and actual steps per day (as per question 2 on homework sheet)

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

What if we don't have one of the areas listed to estimate?
You can either make up an area to cover and estimate the distance to walk, or just leave that one blank for both you and your father.

Reflection:

- Ask students if they realised how much walking they do in general around the home to get from place to place?
- Discuss how technology has made us lazy around the home, e.g., television remote, mobile phones, ride on mowers, washing machines, dryers etc.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 8 – Motivation March

Instructions:

- Handout and explain homework sheet
- Explain how motivation can work to increase someone's activity levels
- Go over the chart (back of homework sheet) and how to fill it in

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

What if I don't reach my goal?
It doesn't matter, it is the trying that matters. Perhaps your goal was too high (e.g., an increase over 10%). Try setting a smaller goal next time so that you can reach it.

Reflection:

- Ask students to give ideas of how they motivated their father to increase his steps. What strategies did they use, e.g., pleading, begging, rewards, nagging etc, or did simply having the chart on the fridge work?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 9 – Pedometer persuasion

Instructions:

- Handout and explain homework sheet
- Discuss some advocacy strategies, e.g., mobile phone messages, prompting, signs around the house, emails, notes in lunch etc.
- Tell students to do poster on back of the homework sheet and hand it in the following week.

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Discuss student ideas on how they prompted Dad/Pedometer Buddy to walk
- Look at posters the student's designed
- Discuss success of advocacy strategies. What worked, what didn't?

Students submit homework sheets along with the poster at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 10 – Stepping Strategies

Instructions:

- Handout and explain homework sheet
- Discuss the term 'barriers to exercise' with the students, ie. what makes it difficult to exercise, or what inhibits or limits opportunities to be physically active?

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

What if I don't have any barriers to physical activity?
Then think about barriers that other people may have and list those.

Reflection:

- Discuss the barriers that students found prevented them from being physically active.
- Discuss the barriers that prevented their fathers from being physically active.
- Discuss the ideas for overcoming these barriers for both students and their fathers

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 11 – Stepping scenarios

Instructions:

- Handout and explain homework sheet
- Explain what scenario means (examples of different situations)
- Explain the term Sedentary (question 4) - Physically inactive

FAQs:

Do we have to do the optional scenario (question 5)?
No it is optional, but it would be very beneficial for you and your pedometer buddy to attempt the scenario.

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Ask students to give examples of ways they came up with to overcome the barriers to exercise in each scenario. What did their Dad/Pedometer Buddy come up with?
- If time, ask students to brainstorm other situations that they have experienced that made it difficult to be physically active, e.g., Going on holidays, dark and cold outside, heaps of homework to do, etc – what could they do to overcome them?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 12 – Tracks and trails

Instructions:

- Handout and explain homework sheet
- Show students what a walking trail looks like in the melways. Use photocopy of school area – with the key and legend highlighted. Explain how to work out distance in the map using the key.

FAQs:

What if I don't have a melways?
You can look up maps on the internet – or borrow the schools melways and photocopy pages from it. Ask mum or Dad/Pedometer Buddy if they have one in the car.

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Ask students if anyone has a walking trail close to their home. Does their family use it? Why/why not?
- Discuss places students can walk to from home. Is school close enough to walk to? Can anyone's parents walk to work? Do they walk to the shops or drive? Does their family utilise the walking areas or local parks?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 13 – Weekday v Weekend

Instructions:

- Handout and explain homework sheet

FAQs:

What if my activities changed this week and were not normal?
Try to record what you do in an average week, so if you haven't done something you normally do each week record it, or vice versa if it is something you don't normally do.

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Discuss whether students and their parents were more active on weekdays or weekends. Why do they think this is?
- Is it possible to be more active during either of these times?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 14 – Active Transport

Instructions:

- Handout and explain homework sheet
- Explain what is meant by energy, ie. Introduce the concept that food produces energy and our bodies use that energy to function.
- Introduce concept of active transport, ie. Walking instead of driving etc.

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Go through answers to activity 1
- Is it possible for you or your family to walk for transport to some places? Students give examples.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 15 – Home Homework

Instructions:

- Handout and explain homework sheet

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Discussion: modern technology has made many things easier in our lives, but has also meant that less activity is needed for day to day living. This activity sheet looked at things we can do everyday that help to increase activity. Students should have identified a number of 'chores' they can do around the house that involve activity. Eg, mowing the lawn, hanging out washing, vacuuming, playing with the dog, washing the car or gardening.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 16 – Energy input/output

Instructions:

- Handout and explain homework sheet
- Discuss that this is an exercise designed to look at how much activity is needed to burn off the energy from various 'healthy' and 'unhealthy' foods. Explain to students it is not an exact measurement as people vary in the intensity that they walk etc and therefore it is just a guide.

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Students discuss healthy food options compared to unhealthy food options and the amount of physical activity required to burn off the kilojoules contained.
- Students give examples of activities that burn high amounts of energy compared to those that burn less or little. Do they do many activities that burn high amounts? Does their Dad/Pedometer Buddy?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 17 – Letter to the editor

Instructions:

- Handout and explain homework sheet
- Remind students that they are to interview their Dad/Pedometer Buddy

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Ask for some students to read their letters to the class.

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 18 – Active for life

Instructions:

- Handout and explain homework sheet
- Describe what is meant by physical – benefits to the physical body, social – benefits to one's life and mental – benefits in one's mind.
- Remind students that they are to interview their Dad/Pedometer Buddy

FAQs:

What if Dad/Pedometer Buddy won't participate?
Ask someone else in the house to participate, but you must let us know.

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Get examples of the benefits of physical activity from students for all 3 areas.
- Discuss times that students were able to get their parents to be physically active – ask for examples (hopefully some students will hear of other examples and be able to tell their parents)

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Activity 19 – Reflection

Instructions:

- Handout and explain homework sheet
- Remind students that they are to interview their Dad/Pedometer Buddy

FAQs:

What if I can't get it done because Dad/Pedometer Buddy is away?
Let us know and you can complete it later and hand it in when he gets home.

Reflection:

- Discuss whether students think their Dad/Pedometer Buddy would continue to think about being more active. Ask students if they would continue to advocate activity to their families.
- Ask students for ideas about advocacy to their parents. Is there anything they felt could have worked better?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Teacher Instruction Sheet

Holiday Activities

Instructions:

- Handout and explain holiday homework sheets
- As part of the program, we would really like the students to complete this activity. It would be good to ask students to think about exercising over the break and if they can plan activities in advance with their families.
- Ask students: If flying during the holidays, why do the airlines encourage activity during the flight?

FAQs:

Should we wear the pedometer during the holidays?
Yes, it would be good to measure how active you are.

What if we go away? Should I take the pedometer?
Yes, it would be fun to know how much activity you did while away.

What if I can't get it done because Dad/Pedometer Buddy is away?
Just complete activities that you do, then speak with Dad/Pedometer Buddy when they get home and complete their activities then. Try to encourage them to be active while away.

Reflection:

- Students talk about their holidays and activities they did.
- Did anyone do walking activities with the family?
- Check whether students 'looked' for opportunities to be more active than normal.
- Did the change in routine (being on holidays) affect how much physical activity you participated in? what about your Dad/Pedometer buddy?

Students submit homework sheets at the end of reflection.

How likely are you to use this activity again?
Never Not likely Likely Very Likely Certainly

How many children completed the homework task?
Not many Half Most

Any other comments/feedback in relation to explaining the task, reflection or student completion:

Appendix I: Pedometer instruction sheets

Children Tips for wearing a pedometer

Children must wear the pedometer with the blue star

Correct

- Pedometers are **NOT** waterproof. Please **DO NOT** place the pedometer in water or allow the pedometer to become wet.
- Pedometers are worn in an upright position, sitting on or close to the hip.
- Wear the pedometer on a belt if possible, or on clothing that has a waistband such pants, skirts or shorts.
- **ALWAYS** attach the safety strap to your clothing, preferably on a belt loop as shown in diagram 1 or on some other part of your clothing.
- When worn correctly, the pedometer logo should be facing away from the body.

Diagram 1

- **For girls only**, if you are wearing a dress without a sturdy belt or waistband, attac pedometer to your underwear with the pedometer logo facing towards your body (see diagram 2). Normally the logo of the pedometer would face away from you, but if worn on your underwear it can be turned around.
- It's normal to hear a noise like something is moving inside the pedometer.
- If a plastic strap has been placed on the pedometer, please do not remove it as this is an important part of the research procedure.
- Please **DO NOT** wear the pedometer in an incorrect manner. Pedometers worn incorrectly will not count steps accurately.
    - A pedometer worn at an angle, as shown in diagram 3 will not work correctly.
    - A pedometer placed inside a pocket will not work
    - A pedometer worn near the "belly-button", as shown in diagram 4 will not work correctly.

Correct, when worn on underwear

Diagram 2

Incorrect

Diagram 3
Worn *incorrectly* at an angle

Incorrect

Diagram 4
Worn *incorrectly* too close to belly-button

Adults *Tips for wearing a pedometer*

- Pedometers are **NOT** waterproof. Please do not place the pedometer in water or allow the pedometer to become wet.
- Pedometers are worn in an upright position, sitting on or close to the hip in a vertical (upright) orientation as shown in diagram 1.

Correct

- Wear the pedometer on a belt if possible. Alternatively, wear the pedometer on clothing that has a waistband such as pants or shorts.
- **ALWAYS** attach the safety strap to your clothing, preferably on a belt loop a shown in diagram 1. This will reduce the chance of losing the pedometer or dropping it when moving about or changing your clothes.
- When worn correctly, the pedometer logo should be facing away from the bo shown in diagram 1.
- It's normal to hear a noise like something is moving inside the pedometer. T suspended lever arm moving up and down with each step.

Diagram 1

- If a plastic strap has been placed on the pedometer, please do not remove it as th important part of the research procedure.
- Please **DO NOT** wear the pedometer in an incorrect manner. Pedometers worn incorrectly will not count steps accurately.
    - A pedometer worn at an angle, as shown in diagram 2 will not work correctly.
    - A pedometer placed inside a pocket will not work, as it is likely to slide out of the vertical position.
    - A pedometer worn near the "belly-button", as shown in diagram 3 will not work correctly.

Incorrect

Diagram 2
Worn *incorrectly* at an angle

Incorrect

Diagram 3
Worn *incorrectly* too close to belly-button

Appendix J: Teacher Evaluation Survey

TEACHER EVALUATION SURVEY

'Walk your Dad' study

Thank you for your involvement in the 'Walk your Dad' study. To help us improve the delivery of the intervention we would appreciate your assistance in completing the following questions.

HOMEWORK TASKS

Did you find the homework activities easy to explain to students?

- o Always
- o Mostly
- o Sometimes
- o Rarely
- o Not at all

Do you think the activities were appropriate for the age of the students?

- o Always
- o Mostly
- o Sometimes
- o Rarely
- o Not at all

Do you think the activities were appropriate for the **parents**?

- o Always
- o Mostly
- o Sometimes
- o Rarely
- o Not at all

Did you think that the homework activities were enjoyable and interesting for the students?

- o Always
- o Mostly
- o Sometimes
- o Rarely
- o Not at all

Did you think that the homework activities were enjoyable and interesting for the **parents**?

- Always
- Mostly
- Sometimes
- Rarely
- Not at all

Are there any other ideas for activities that you can think of that we did not do?

_____
_____
_____
_____

Did you have time to reflect on every homework task?

- Always
- Mostly
- Sometimes
- Rarely
- Not at all

What were some of the best reflection activities? ie. What you did in class with them to reflect on the homework task.

_____
_____
_____

What were some of the least enjoyable reflection activities? ie. What you did in class with them to reflect on the homework task.

_____
_____
_____

Did the children complete all of the activities on the homework tasks?

- Always
- Mostly
- Sometimes
- Rarely
- Not at all

How many of the children handed in their homework tasks each week?

- All
- Most
- About half
- Not many

TEACHER INSTRUCTIONS

Did the 'teacher instructions' assist you with your explanations of the homework activities?

- Always
- Mostly
- Sometimes
- Rarely
- Not at all

Did you complete the teacher questions at the bottom of the teacher instructions sheet?

- Always
- Mostly
- Sometimes
- Rarely
- Not at all

Was there anything you would add or remove from the teacher instruction sheets to make it easier for you to explain the activities to the students?

_____
_____
_____
_____
_____

ADMINISTRATION/ORGANISATION

Do you feel that you had all of the information you needed about the project to deliver it effectively to the students? Please explain.

_____
_____

_____
_____

Do you think a training session focussed on the delivery of the program would have been beneficial?

_____
_____
_____
_____

Do you think it was a problem that the program was in place over the holiday period?

_____
_____
_____

Did the activities fit within the 5/6 curriculum and VELS standards? Please explain

_____
_____
_____

With which year levels do you think this intervention would be most effective?

- Grades 3/4
- Grades 5/6
- Years 7/8
- Years 9/10

What length of time do you believe would be best for a unit like this to be included in your teaching program?

- 4-5 weeks
- 7-8 weeks
- 10 weeks
- 12 or more weeks

Do you think 2 homework tasks per week is appropriate for this age class? Explain

_____
_____
_____

What do you think is the best way to store the homework sheets for the students?

- Booklet with all sheets contained for entire project
- Individual sheets handed out each week
- Plastic folder to place sheets in handed out each week

Would you prefer a booklet of activities that you could select from according to the curriculum rather than giving out the homework in a particular order each week?

_____
_____
_____
_____

Thank you.

Appendix K: Original, Pre-Imputed Mean Scores

Mean results of pedometer steps for children – original data

Variables	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Weekend Steps		
Boy		
5/6 J	17481.40 +/- 8828.70	27970.00 +/- 14402.22
5/6 B	18679.75 +/- 20928.17	33450.00 +/- 15351.77
5/6 H	23000.40 +/- 12800.92	21115.67 +/- 6833.66
Girl		
5/6 J	11424.00 +/- 3757.80	18606.17 +/- 9113.57
5/6 B	15426.13 +/- 11483.22	6009.00 +/- 6602.96
5/6 H	16675.00 +/- 8316.44	10035.67 +/- 4713.87
Weekday Steps		
Boy		
5/6 J	52141.67 +/- 10362.05	44480.67 +/- 7232.81
5/6 B	56478.67 +/- 13495.15	55929.00 +/- 13204.51
5/6 H	49130.10 +/- 12854.73	42546.63 +/- 10260.94
Girl		
5/6 J	33013.30 +/- 12097.26	31721.13 +/- 15116.81
5/6 B	34072.44 +/- 13354.63	38037.00 +/- 13769.55
5/6 H	38666.00 +/- 9419.46	30860.67 +/- 21319.55

Mean results of pedometer steps for parents – original data

Variables	Pre-test Data Mean +/- SD	Post-test Data Mean +/- SD
Weekend Steps		
5/6 J	15939.47 +/- 4886.39	15065.91 +/- 6727.88
5/6 B	14043.50 +/-7098.19	18875.50 +/- 10739.82
5/6 H	18592.89 +/-8682.76	15433.89 +/- 6293.28
Weekday Steps		
5/6 J	34948.89 +/- 15243.36	33798.25 +/- 10573.51
5/6 B	26869.44 +/- 12691.19	33923.67 +/- 18091.59
5/6 H	34898.39 +/-13869.18	32764.90 +/- 13853.29

Appendix L: Original and Imputed Data Set

Children pre-test

Class	Gr	Sex	Sunday Pre-Test Original	Sunday Pre-Test Imputed	Saturday Pre-Test Original	Saturday Pre-Test Imputed	Friday Pre-Test Original	Friday Pre-Test Imputed	Thursday Pre-Test Original	Thursday Pre-Test Imputed	Wednesday Pre-Test Original	Wednesday Pre-Test Imputed	Tuesday Pre-Test Original	Tuesday Pre-Test Imputed
Intervention	6	Boy	1,471.00	1,471.00	3,757.00	3,757.00	18,281.00	18,281.00	13,706.00	13,706.00	13,707.00	13,707.00	6,811.00	6,811.00
Intervention	6	Boy	6,549.00	6,549.00	11,879.00	11,879.00	777.00	14,494.00	15,054.00	15,054.00	10,855.00	10,855.00	7,499.00	7,499.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	6	Boy	1,942.00	1,942.00	2,474.00	2,474.00	9,263.00	9,263.00	9,862.00	9,862.00	9,413.00	9,413.00	6,234.00	6,234.00
Control	6	Girl	5,832.00	5,832.00	6,889.00	6,889.00	13,581.00	13,581.00	10,284.00	10,284.00	10,707.00	10,707.00	8,890.00	8,890.00
Control	6	Girl	10,492.00	10,492.00	7,685.00	7,685.00	10,387.00	10,387.00	13,275.00	13,275.00	13,265.00	13,265.00	9,606.00	9,606.00
Intervention	6	Girl	13,949.00	13,949.00	439.00	16,925.00	781.00	9,361.00	2,252.00	2,252.00	8,478.00	8,478.00	10,191.00	10,191.00
Control	6	Boy	28,566.00	14,270.00	10,680.00	10,680.00	8,137.00	8,137.00	11,527.00	11,527.00	13,415.00	13,415.00	8,441.00	8,441.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	6	Girl	2,831.00	2,831.00	777.00	10,528.00	7,790.00	7,790.00	9,841.00	9,841.00	13,029.00	13,029.00	7,434.00	7,434.00
Intervention	6	Boy	5,891.00	5,891.00	777.00	3,130.00	18,030.00	18,030.00	14,433.00	14,433.00	6,702.00	6,702.00	17,588.00	17,588.00
Intervention	6	Girl	3,063.00	3,063.00	694.00	9,034.00	4,633.00	4,633.00	8,813.00	8,813.00	8,608.00	8,608.00	9,854.00	9,854.00
Intervention	5	Boy	13,030.00	13,030.00	35,454.00	5,742.00	23,128.00	23,128.00	17,895.00	17,895.00	15,711.00	15,711.00	18,259.00	10,908.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	6	Girl	12,483.00	12,483.00	16,925.00	16,925.00	12,680.00	12,680.00	10,675.00	10,675.00	7,909.00	7,909.00	8,911.00	8,911.00
Intervention	6	Boy	777.00	14,270.00	10,830.00	10,830.00	24,176.00	24,176.00	66.00	17,895.00	13,444.00	13,444.00	777.00	18,259.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	777.00	7,390.00	43.00	7,207.00	14,084.00	14,084.00	14,007.00	14,007.00
Intervention	5	Girl	2,939.00	2,939.00	10,528.00	10,528.00	14,045.00	14,045.00	9,957.00	9,957.00	10,532.00	10,532.00	9,429.00	9,429.00
Intervention	6	Girl	10,185.00	10,185.00	23,892.00	7,685.00	12,565.00	12,565.00	10,140.00	10,140.00	11,547.00	11,547.00	8,480.00	8,480.00
Intervention	5	Girl	9,208.00	9,208.00	7,845.00	7,845.00	13,789.00	13,789.00	8,469.00	8,469.00	12,467.00	12,467.00	624.00	8,480.00
Intervention	5	Boy	3,050.00	3,050.00	3.00	8,616.00	18,491.00	18,491.00	11,942.00	11,942.00	672.00	12,209.00	14,793.00	14,793.00
Intervention	5	Girl	841.00	2,991.00	2,289.00	2,289.00	1,648.00	1,648.00	84.00	2,266.00	2,175.00	8,669.00	389.00	7,096.00
Intervention	5	Boy	4,748.00	4,748.00	13,206.00	13,206.00	31,015.00	18,491.00	14,612.00	14,612.00	12,022.00	12,022.00	11,393.00	11,393.00
Intervention	5	Girl	6,532.00	6,532.00	9,782.00	9,782.00	14,118.00	14,118.00	14,225.00	14,225.00	6,350.00	6,350.00	12,736.00	12,736.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	7,390.00	7,390.00	7,207.00	7,207.00	12,257.00	12,257.00	12,827.00	12,827.00
Intervention	5	Girl	5,190.00	5,190.00	1,013.00	1,013.00	172.00	4,633.00	6,047.00	6,047.00	7,999.00	7,999.00	8,488.00	8,488.00
Control	5	Girl	1,742.00	1,742.00	12,408.00	12,408.00	18,587.00	18,587.00	11,277.00	11,277.00	12,282.00	12,282.00	6,907.00	6,907.00

Control	6	Boy	12,271.00	12,271.00	27,441.00	10,013.00	23,511.00	23,511.00	13,844.00	13,844.00	18,635.00	18,635.00	13,289.00	13,289.00
Control	5	Boy	8,037.00	8,037.00	5,553.00	5,553.00	11,169.00	11,169.00	8,101.00	8,101.00	10,427.00	10,427.00	7,581.00	7,581.00
Control	6	Boy	14,270.00	14,270.00	10,013.00	10,013.00	16,445.00	16,445.00	13,676.00	13,676.00	9,633.00	9,633.00	10,364.00	10,364.00
Control	5	Girl	654.00	6,658.00	4,335.00	4,335.00	9,029.00	9,029.00	9,709.00	9,709.00	10,850.00	10,850.00	8,293.00	8,293.00
Control	6	Boy	11,147.00	11,147.00	3,540.00	3,540.00	15,495.00	15,495.00	9,773.00	9,773.00	17,106.00	17,106.00	7,788.00	7,788.00
Control	6	Girl	7,763.00	7,763.00	3,401.00	3,401.00	9,596.00	9,596.00	7,702.00	7,702.00	58.00	10,850.00	8,239.00	8,239.00
Control	5	Boy	8,368.00	8,368.00	10,045.00	10,045.00	13,535.00	13,535.00	9,725.00	9,725.00	15,852.00	15,852.00	15,852.00	15,852.00
Control	6	Girl	999.00	999.00	999.00	999.00	5,129.00	5,129.00	777.00	8,813.00	10,398.00	10,398.00	423.00	8,293.00
Control	6	Boy	255.00	14,270.00	8,977.00	8,977.00	14,261.00	14,261.00	13,050.00	13,050.00	12,131.00	12,131.00	15,552.00	15,552.00
Intervention	5	Boy	6,684.00	6,684.00	4,135.00	4,135.00	20,001.00	20,001.00	4,878.00	4,878.00	13,715.00	13,715.00	15,722.00	15,722.00
Intervention	6	Boy	22,052.00	9,804.00	11,167.00	11,167.00	20,273.00	20,273.00	16,381.00	16,381.00	16,094.00	16,094.00	10,908.00	10,908.00
Intervention	6	Boy	5,393.00	5,393.00	3,130.00	3,130.00	17,435.00	17,435.00	4,320.00	4,320.00	15,194.00	15,194.00	18,957.00	18,957.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	298.00	9,495.00	8,810.00	8,810.00	10,910.00	10,910.00	10,322.00	10,322.00
Intervention	6	Boy	3,189.00	3,189.00	8,616.00	8,616.00	13,822.00	13,822.00	10,789.00	10,789.00	13,834.00	13,834.00	9,585.00	9,585.00
Intervention	6	Girl	2,991.00	2,991.00	2,919.00	2,919.00	1,414.00	1,414.00	2,266.00	2,266.00	1,046.00	8,669.00	7,096.00	7,096.00
Intervention	5	Girl	2,238.00	2,238.00	9,034.00	9,034.00	10,668.00	10,668.00	11,107.00	11,107.00	11,232.00	11,232.00	10,580.00	10,580.00
Intervention	5	Girl	8,050.00	8,050.00	8,263.00	8,263.00	9,361.00	9,361.00	3,208.00	3,208.00	8,669.00	8,669.00	7,155.00	7,155.00
Intervention	5	Girl	4,791.00	4,791.00	6,540.00	6,540.00	9,332.00	9,332.00	5,947.00	5,947.00	9,164.00	9,164.00	11,106.00	11,106.00
Intervention	6	Boy	9,804.00	9,804.00	11,429.00	11,429.00	20,510.00	20,510.00	12,918.00	12,918.00	12,209.00	12,209.00	14,198.00	14,198.00
Intervention	6	Boy	6,064.00	6,064.00	25,493.00	11,879.00	16,222.00	16,222.00	18,794.00	18,794.00	9,479.00	9,479.00	9,485.00	9,485.00
Intervention	6	Girl	6,658.00	6,658.00	4,759.00	4,759.00	9,010.00	9,010.00	9,902.00	9,902.00	7,671.00	7,671.00	2,858.00	2,858.00
Intervention	5	Girl	6,262.00	6,262.00	23.00	4,759.00	9,495.00	9,495.00	9,217.00	9,217.00	9,156.00	9,156.00	8,917.00	8,917.00
Intervention	5	Boy	11,353.00	11,353.00	5,742.00	5,742.00	14,494.00	14,494.00	15,869.00	15,869.00	10,716.00	10,716.00	12,128.00	12,128.00
Intervention	6	Girl	8,488.00	8,488.00	5,988.00	5,988.00	14,965.00	14,965.00	13,560.00	13,560.00	15,842.00	15,842.00	12,272.00	12,272.00
Intervention	5	Boy	4,990.00	4,990.00	6,932.00	6,932.00	20,826.00	20,826.00	11,501.00	11,501.00	11,843.00	11,843.00	9,048.00	9,048.00
Intervention	6	Boy	3,523.00	3,523.00	6,690.00	6,690.00	6,972.00	6,972.00	4,679.00	4,679.00	8,060.00	8,060.00	7,416.00	7,416.00
Control	5	Boy	9,406.00	9,406.00	21,845.00	10,045.00	6,664.00	6,664.00	13,936.00	13,936.00	210.00	9,633.00	10,887.00	10,887.00
Control	5	Boy	7,045.00	7,045.00	28,129.00	5,553.00	18,563.00	18,563.00	17,437.00	17,437.00	14,463.00	14,463.00	16,054.00	16,054.00
Control	5	Girl	16,517.00	16,517.00	15,709.00	15,709.00	16,693.00	16,693.00	8,522.00	8,522.00	13,361.00	13,361.00	11,710.00	11,710.00
Control	5	Girl	7,072.00	7,072.00	9,095.00	9,095.00	18,535.00	18,535.00	745.00	11,277.00	9,158.00	9,158.00	3,846.00	3,846.00
Control	6	Girl	999.00	999.00	999.00	999.00	326.00	10,387.00	15,729.00	15,729.00	2.00	13,265.00	9,663.00	9,663.00
Control	6	Girl	15,208.00	15,208.00	8,598.00	8,598.00	9,635.00	9,635.00	12,312.00	12,312.00	8,527.00	8,527.00	6,706.00	6,706.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	5,759.00	5,759.00	9,024.00	9,024.00	12,310.00	12,310.00	8,782.00	8,782.00

Children Post-test

Class	Gr	Sex	Sunday Post-Test Original	Sunday Post-Test Imputed	Saturday Post-Test Original	Saturday Post-Test Imputed	Friday Post-Test Original	Friday Post-Test Imputed	Thursday Post-Test Original	Thursday Post-Test Imputed	Wednesday Post-Test Original	Wednesday Post-Test Imputed	Tuesday Post-Test Original	Tuesday Post-Test Imputed
Intervention	6	Boy	12,331.00	12,331.00	33,835.00	26,874.00	17,466.00	17,466.00	13,705.00	13,705.00	15,075.00	15,075.00	6,811.00	6,811.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	7,499.00	7,499.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	4,939.00	4,939.00	3,770.00	3,770.00	1,598.00	1,598.00	999.00	999.00
Control	6	Boy	3,836.00	3,836.00	777.00	4,822.00	6,436.00	6,436.00	5,149.00	5,149.00	6,930.00	6,930.00	6,234.00	6,234.00
Control	6	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	8,890.00	8,890.00
Control	6	Girl	109.00	11,467.00	4,593.00	4,593.00	777.00	8,103.00	12,178.00	12,178.00	2.00	13,010.00	9,606.00	9,606.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	10,191.00	10,191.00
Control	6	Boy	999.00	999.00	999.00	999.00	1,647.00	1,647.00	19,108.00	19,108.00	17,345.00	17,345.00	8,441.00	8,441.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	6	Girl	74.00	5,382.00	1,266.00	1,266.00	19,513.00	19,513.00	10,985.00	10,985.00	10,437.00	10,437.00	7,434.00	7,434.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	17,588.00	17,588.00
Intervention	6	Girl	5,382.00	5,382.00	5,296.00	5,296.00	8,552.00	8,552.00	9,878.00	9,878.00	8,941.00	8,941.00	9,854.00	9,854.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	18,259.00	10,908.00
Intervention	5	Boy	16,392.00	16,392.00	4.00	23,797.00	22,205.00	22,205.00	777.00	17,253.00	25,703.00	25,703.00	999.00	999.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	5.00	9,344.00	3.00	9,884.00	14,234.00	14,234.00	8,911.00	8,911.00
Intervention	6	Boy	10,914.00	10,914.00	26,874.00	26,874.00	22,507.00	22,507.00	17,253.00	17,253.00	6,816.00	6,816.00	777.00	18,259.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	14,007.00	14,007.00
Intervention	5	Girl	777.00	5,759.00	20,446.00	20,446.00	12,903.00	12,903.00	14,917.00	14,917.00	12,091.00	12,091.00	9,429.00	9,429.00
Intervention	6	Girl	777.00	5,382.00	4,882.00	4,882.00	999.00	999.00	999.00	999.00	999.00	999.00	8,480.00	8,480.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	624.00	8,480.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	14,793.00	14,793.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	389.00	7,096.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	11,393.00	11,393.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	777.00	12,903.00	15,040.00	15,040.00	330.00	12,091.00	12,736.00	12,736.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	12,827.00	12,827.00
Intervention	5	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	8,488.00	8,488.00
Control	5	Girl	4,238.00	4,238.00	777.00	2,176.00	7,843.00	7,843.00	8,534.00	8,534.00	10,050.00	10,050.00	6,907.00	6,907.00
Control	6	Boy	12,445.00	12,445.00	10,039.00	10,039.00	17,022.00	17,022.00	12,182.00	12,182.00	1,306.00	1,306.00	13,289.00	13,289.00
Control	5	Boy	6,360.00	6,360.00	10,437.00	10,437.00	10,896.00	10,896.00	10,514.00	10,514.00	8,113.00	8,113.00	7,581.00	7,581.00

Control	6	Boy	13,834.00	13,834.00	13,651.00	13,651.00	12,012.00	12,012.00	15,007.00	15,007.00	11,232.00	11,232.00	10,364.00	10,364.00
Control	5	Girl	999.00	999.00	999.00	999.00	8,103.00	8,103.00	11,386.00	11,386.00	7,650.00	7,650.00	8,293.00	8,293.00
Control	6	Boy	12,640.00	12,640.00	15,492.00	15,492.00	12,686.00	12,686.00	11,272.00	11,272.00	9,096.00	9,096.00	7,788.00	7,788.00
Control	6	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	8,239.00	8,239.00
Control	5	Boy	5,214.00	5,214.00	4,822.00	4,822.00	11,491.00	11,491.00	10,376.00	10,376.00	13,634.00	13,634.00	15,852.00	15,852.00
Control	6	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	423.00	8,293.00
Control	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	15,552.00	15,552.00
Intervention	5	Boy	20,528.00	20,528.00	23,797.00	23,797.00	10,723.00	10,723.00	24.00	13,744.00	18,666.00	18,666.00	15,722.00	15,722.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	10,908.00	10,908.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	8,657.00	8,657.00	9,448.00	9,448.00	9,286.00	9,286.00	18,957.00	18,957.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	5,606.00	5,606.00	90.00	6,745.00	2.00	8,748.00	10,322.00	10,322.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	9,585.00	9,585.00
Intervention	6	Girl	777.00	5,382.00	4,307.00	4,307.00	11,358.00	11,358.00	12.00	14,353.00	177.00	17,690.00	7,096.00	7,096.00
Intervention	5	Girl	5,759.00	5,759.00	18,193.00	18,193.00	8,874.00	8,874.00	7,703.00	7,703.00	11,960.00	11,960.00	10,580.00	10,580.00
Intervention	5	Girl	7,549.00	7,549.00	9,436.00	9,436.00	9,344.00	9,344.00	9,884.00	9,884.00	13,243.00	13,243.00	7,155.00	7,155.00
Intervention	5	Girl	11,786.00	11,786.00	7,551.00	7,551.00	8,249.00	8,249.00	9,222.00	9,222.00	9,474.00	9,474.00	11,106.00	11,106.00
Intervention	6	Boy	11,404.00	11,404.00	5,779.00	5,779.00	11,027.00	11,027.00	13,744.00	13,744.00	18,820.00	18,820.00	14,198.00	14,198.00
Intervention	6	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	9,485.00	9,485.00
Intervention	6	Girl	17,478.00	17,478.00	157.00	10,938.00	12,113.00	12,113.00	14,353.00	14,353.00	17,690.00	17,690.00	2,858.00	2,858.00
Intervention	5	Girl	315.00	5,382.00	2,828.00	2,828.00	8,322.00	8,322.00	6,745.00	6,745.00	8,748.00	8,748.00	8,917.00	8,917.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	12,128.00	12,128.00
Intervention	6	Girl	19,647.00	19,647.00	10,938.00	10,938.00	16,397.00	16,397.00	16,035.00	16,035.00	12,982.00	12,982.00	12,272.00	12,272.00
Intervention	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	9,048.00	9,048.00
Intervention	6	Boy	11,306.00	11,306.00	11,096.00	11,096.00	9,365.00	9,365.00	7,947.00	7,947.00	7,034.00	7,034.00	7,416.00	7,416.00
Control	5	Boy	12,788.00	12,788.00	8,972.00	8,972.00	15,779.00	15,779.00	18,055.00	18,055.00	11,896.00	11,896.00	10,887.00	10,887.00
Control	5	Boy	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	16,054.00	16,054.00
Control	5	Girl	11,467.00	11,467.00	2,176.00	2,176.00	15,129.00	15,129.00	10,728.00	10,728.00	13,010.00	13,010.00	11,710.00	11,710.00
Control	5	Girl	11,556.00	11,556.00	206.00	2,176.00	777.00	7,843.00	9,438.00	9,438.00	9,290.00	9,290.00	3,846.00	3,846.00
Control	6	Girl	999.00	999.00	999.00	999.00	2,481.00	2,481.00	1,989.00	1,989.00	1,933.00	1,933.00	9,663.00	9,663.00
Control	6	Girl	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	6,706.00	6,706.00
Intervention	6	Girl	999.00	999.00	999.00	999.00	777.00	4,939.00	103.00	3,770.00	1,388.00	1,388.00	8,782.00	8,782.00

Parent Pre-Test

Class	Sex	Sunday Pre-Test Original	Sunday Pre-Test Imputed	Saturday Pre-Test Original	Saturday Pre-Test Imputed	Friday Pre-Test Original	Friday Pre-Test Imputed	Thursday Pre-Test Original	Thursday Pre-Test Imputed	Wednesday Pre-Test Original	Wednesday Pre-Test Imputed	Tuesday Pre-Test Original	Tuesday Pre-Test Imputed
Intervention	Male	7,604.00	7,604.00	9,521.00	9,521.00	5,944.00	5,944.00	3,510.00	3,510.00	4,646.00	4,646.00	4,426.00	4,426.00
Intervention	Male	6,630.00	6,630.00	2,352.00	2,352.00	10,441.00	10,441.00	5,349.00	5,349.00	10,873.00	10,873.00	9,274.00	9,274.00
Intervention	Female	4,722.00	4,722.00	3,316.00	3,316.00	5,745.00	5,745.00	5,227.00	5,227.00	5,238.00	5,238.00	5,457.00	5,457.00
Control	Male	1,743.00	1,743.00	3,927.00	3,927.00	5,186.00	5,186.00	5,351.00	5,351.00	8,045.00	8,045.00	4,407.00	4,407.00
Control	Male	3,979.00	3,979.00	13,573.00	13,573.00	12,558.00	12,558.00	21,103.00	11,362.00	10,419.00	10,419.00	14,064.00	14,064.00
Control	Male	22,938.00	1,743.00	3,837.00	3,837.00	12,138.00	12,138.00	10,444.00	10,444.00	7,230.00	7,230.00	6,749.00	6,749.00
Intervention	Female	999.00	999.00	999.00	999.00	2.00	5,745.00	74.00	5,227.00	3,646.00	3,646.00	6,542.00	6,542.00
Control	Male	144.00	4,674.00	15,614.00	15,614.00	4,252.00	4,252.00	51.00	6,546.00	11.00	5,632.00	1,218.00	1,218.00
Intervention	Male	865.00	2,516.00	3,417.00	3,417.00	2,663.00	2,663.00	3,380.00	3,380.00	4,391.00	4,391.00	3,827.00	3,827.00
Intervention	Female	6,594.00	6,594.00	9,274.00	9,274.00	17,020.00	17,020.00	17,323.00	17,323.00	8,823.00	8,823.00	7,221.00	7,221.00
Intervention	Male	5,819.00	5,819.00	12,370.00	12,370.00	7,022.00	7,022.00	12,101.00	12,101.00	13,563.00	13,563.00	7,237.00	7,237.00
Intervention	Male	3,702.00	3,702.00	7,737.00	7,737.00	4,402.00	4,402.00	1,647.00	1,647.00	11.00	5,632.00	6.00	2,685.00
Intervention	Male	2,516.00	2,516.00	3,081.00	3,081.00	6,038.00	6,038.00	5,221.00	5,221.00	5,228.00	5,228.00	5,827.00	5,827.00
Intervention	Male	13,037.00	13,037.00	9,047.00	9,047.00	7,859.00	7,859.00	8,933.00	8,933.00	5,908.00	5,908.00	7,310.00	7,310.00
Intervention	Male	999.00	999.00	999.00	999.00	777.00	7,956.00	8,767.00	8,767.00	9,171.00	9,171.00	9,239.00	9,239.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Female	9,831.00	9,831.00	13,350.00	13,350.00	8,486.00	8,486.00	6,305.00	6,305.00	6,679.00	6,679.00	7,700.00	7,700.00
Intervention	Male	9,637.00	9,637.00	8,381.00	8,381.00	13,739.00	13,739.00	7,835.00	7,835.00	17,289.00	17,289.00	388.00	9,055.00
Intervention	Male	306.00	5,256.00	6,867.00	6,867.00	3,716.00	3,716.00	3,839.00	3,839.00	7,589.00	7,589.00	6,181.00	6,181.00
Intervention	Male	2,116.00	2,116.00	3,196.00	3,196.00	1,625.00	1,625.00	1,251.00	1,251.00	1,544.00	1,544.00	1,672.00	1,672.00
Intervention	Female	67.00	10,320.00	11,227.00	11,227.00	8,324.00	8,324.00	11,916.00	11,916.00	7,880.00	7,880.00	4,606.00	4,606.00
Intervention	Female	10,320.00	10,320.00	10,640.00	10,640.00	10,959.00	10,959.00	14,080.00	14,080.00	7,560.00	7,560.00	11,041.00	11,041.00
Intervention	Male	9,593.00	9,593.00	9,302.00	9,302.00	2,098.00	2,098.00	5,289.00	5,289.00	17,422.00	17,422.00	2,753.00	2,753.00
Intervention	Male	17,685.00	17,685.00	4,496.00	4,496.00	11,099.00	11,099.00	5,856.00	5,856.00	8,263.00	8,263.00	4,139.00	4,139.00
Control	Male	5,256.00	5,256.00	7,046.00	7,046.00	11,315.00	11,315.00	8,167.00	8,167.00	4,536.00	4,536.00	3,371.00	3,371.00
Control	Male	13,149.00	13,149.00	14,193.00	14,193.00	13,060.00	13,060.00	9,528.00	9,528.00	1,742.00	1,742.00	868.00	3,371.00
Control	Male	75.00	1,743.00	4,881.00	4,881.00	3,452.00	3,452.00	7,526.00	7,526.00	7,245.00	7,245.00	5,508.00	5,508.00
Control	Male	2,738.00	2,738.00	9,077.00	9,077.00	9,767.00	9,767.00	11,362.00	11,362.00	10,560.00	10,560.00	13,465.00	13,465.00
Control	Male	6,235.00	6,235.00	5,845.00	5,845.00	6,199.00	6,199.00	11,821.00	11,821.00	12,197.00	12,197.00	13,901.00	13,901.00
Control	Male	16,517.00	16,517.00	10,080.00	10,080.00	4,718.00	4,718.00	11,410.00	11,410.00	7,369.00	7,369.00	15,566.00	15,566.00

Control	Male	8,404.00	8,404.00	12,330.00	12,330.00	8,480.00	8,480.00	4,915.00	4,915.00	6,874.00	6,874.00	8,872.00	8,872.00
Control	Male	11,918.00	11,918.00	10,396.00	10,396.00	7,606.00	7,606.00	7,979.00	7,979.00	7,441.00	7,441.00	7,777.00	7,777.00
Control	Male	14,534.00	14,534.00	21,771.00	21,771.00	9,797.00	9,797.00	12,053.00	12,053.00	13,376.00	13,376.00	10,843.00	10,843.00
Intervention	Male	7,397.00	7,397.00	6,558.00	6,558.00	3,619.00	3,619.00	5,477.00	5,477.00	3,468.00	3,468.00	3,980.00	3,980.00
Intervention	Male	5,013.00	5,013.00	10,925.00	10,925.00	11,040.00	11,040.00	14,711.00	14,711.00	7,255.00	7,255.00	12,130.00	12,130.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	7,464.00	7,464.00	11,030.00	11,030.00	10,899.00	10,899.00
Intervention	Male	5,260.00	5,260.00	6,632.00	6,632.00	8,385.00	8,385.00	5,846.00	5,846.00	7,190.00	7,190.00	2,966.00	2,966.00
Intervention	Male	10,364.00	10,364.00	5,837.00	5,837.00	4,064.00	4,064.00	3,278.00	3,278.00	3,053.00	3,053.00	6,604.00	6,604.00
Intervention	Male	7,953.00	7,953.00	2,972.00	2,972.00	21,524.00	21,524.00	20,917.00	20,917.00	13,736.00	13,736.00	11,190.00	11,190.00
Intervention	Male	2,272.00	2,272.00	13,593.00	13,593.00	12,711.00	12,711.00	13,701.00	13,701.00	16,682.00	16,682.00	9,055.00	9,055.00
Intervention	Male	6,346.00	6,346.00	9,970.00	9,970.00	8,291.00	8,291.00	8,255.00	8,255.00	8,601.00	8,601.00	4,388.00	4,388.00
Intervention	Male	7,673.00	7,673.00	12,201.00	12,201.00	15,014.00	15,014.00	6,592.00	6,592.00	7,751.00	7,751.00	2,136.00	2,136.00
Intervention	Female	8,859.00	8,859.00	11,131.00	11,131.00	15,013.00	15,013.00	16,398.00	16,398.00	15,024.00	15,024.00	18,271.00	7,221.00
Intervention	Male	8,271.00	8,271.00	8,303.00	8,303.00	7,863.00	7,863.00	6,651.00	6,651.00	8,794.00	8,794.00	12,167.00	12,167.00
Intervention	Male	5,976.00	5,976.00	9,508.00	9,508.00	15,768.00	15,768.00	3,556.00	3,556.00	11,614.00	11,614.00	10,445.00	10,445.00
Intervention	Male	4,959.00	4,959.00	5,827.00	5,827.00	10,657.00	10,657.00	5,911.00	5,911.00	8,967.00	8,967.00	5,594.00	5,594.00
Intervention	Male	6,476.00	6,476.00	6,139.00	6,139.00	15,389.00	15,389.00	10,135.00	10,135.00	10,275.00	10,275.00	9,872.00	9,872.00
Intervention	Male	7,934.00	7,934.00	10,958.00	10,958.00	7,956.00	7,956.00	8,067.00	8,067.00	9,526.00	9,526.00	7,536.00	7,536.00
Intervention	Male	16,420.00	16,420.00	10,567.00	10,567.00	5,622.00	5,622.00	9,952.00	9,952.00	10,325.00	10,325.00	8,688.00	8,688.00
Control	Male	7,013.00	7,013.00	4,802.00	4,802.00	12,475.00	12,475.00	6,461.00	6,461.00	13,244.00	13,244.00	5,468.00	5,468.00
Control	Male	11,721.00	11,721.00	13,600.00	13,600.00	4,593.00	4,593.00	5,950.00	5,950.00	13,131.00	13,131.00	7,477.00	7,477.00
Control	Male	13,006.00	13,006.00	14,581.00	14,581.00	11,880.00	11,880.00	12,408.00	12,408.00	11,087.00	11,087.00	8,056.00	8,056.00
Control	Male	9,558.00	9,558.00	10,423.00	10,423.00	16,193.00	16,193.00	13,912.00	13,912.00	13,919.00	13,919.00	18,164.00	10,843.00
Control	Male	5,120.00	5,120.00	4,648.00	4,648.00	4,998.00	4,998.00	6,546.00	6,546.00	5,632.00	5,632.00	2,685.00	2,685.00
Intervention	Male	4,674.00	4,674.00	15,603.00	15,603.00	9,105.00	9,105.00	10,887.00	10,887.00	3,583.00	3,583.00	999.00	7,310.00

Parent Post-Test

Class	Sex	Sunday Post-Test Original	Sunday Post-Test Imputed	Saturday Post-Test Original	Saturday Post-Test Imputed	Friday Post-Test Original	Friday Post-Test Imputed	Thursday Post-Test Original	Thursday Post-Test Imputed	Wednesday Post-Test Original	Wednesday Post-Test Imputed	Tuesday Post-Test Original	Tuesday Post-Test Imputed
Intervention	Male	11,073.00	11,073.00	10,410.00	10,410.00	4,174.00	4,174.00	3,839.00	3,839.00	777.00	9,385.00	777.00	6,108.00
Intervention	Male	999.00	999.00	999.00	999.00	8,379.00	8,379.00	6,671.00	6,671.00	8,404.00	8,404.00	8,277.00	8,277.00
Intervention	Female	12,903.00	12,903.00	11,017.00	11,017.00	8,438.00	8,438.00	10,229.00	10,229.00	8,279.00	8,279.00	2,893.00	2,893.00
Control	Male	3,468.00	9,021.00	7,603.00	7,603.00	777.00	9,733.00	6,045.00	6,045.00	11,110.00	11,110.00	1,127.00	1,127.00
Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	Male	103.00	8,633.00	9,277.00	9,277.00	7,816.00	7,816.00	7,097.00	7,097.00	7.00	6,683.00	6,092.00	6,092.00
Intervention	Female	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	3,625.00	3,625.00	2,617.00	2,617.00	4,524.00	4,524.00	4,004.00	4,004.00	16.00	9,385.00	3,086.00	3,086.00
Intervention	Female	18,245.00	12,903.00	11,371.00	11,371.00	6,766.00	6,766.00	14,071.00	14,071.00	10,037.00	10,037.00	18,023.00	18,023.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	17,133.00	17,133.00	11,528.00	11,528.00	8,303.00	8,303.00	9,274.00	9,274.00	9,216.00	9,216.00	4,949.00	4,949.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	777.00	8,477.00	15,425.00	15,425.00	11,878.00	11,878.00	8,133.00	8,133.00	786.00	12,795.00	929.00	7,557.00
Intervention	Female	10,007.00	10,007.00	12,106.00	12,106.00	5,629.00	5,629.00	8,556.00	8,556.00	5,548.00	5,548.00	8,818.00	8,818.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Female	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Female	5,129.00	5,129.00	9.00	11,371.00	17,858.00	17,858.00	13,033.00	13,033.00	11,506.00	11,506.00	18,599.00	18,599.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	Male	16.00	11,115.00	3,052.00	3,052.00	6,781.00	6,781.00	9,063.00	9,063.00	17,146.00	17,146.00	18,369.00	18,369.00
Control	Male	999.00	999.00	999.00	999.00	1,612.00	1,612.00	1,095.00	1,095.00	1,152.00	1,152.00	9,568.00	9,568.00
Control	Male	999.00	999.00	999.00	999.00	5,874.00	5,874.00	10,298.00	10,298.00	6,683.00	6,683.00	5,640.00	5,640.00
Control	Male	8,633.00	8,633.00	9,201.00	9,201.00	11,265.00	11,265.00	8,677.00	8,677.00	9,580.00	9,580.00	14,021.00	14,021.00
Control	Male	999.00	999.00	999.00	999.00	777.00	4,154.00	5,230.00	5,230.00	2,853.00	2,853.00	127.00	6,108.00
Control	Male	5,017.00	5,017.00	15,503.00	15,503.00	3,977.00	3,977.00	8,798.00	8,798.00	3,377.00	2,969.00	10,751.00	10,751.00

Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	Male	11,115.00	11,115.00	7,457.00	7,457.00	7,694.00	7,694.00	11,814.00	11,814.00	10,604.00	10,604.00	55.00	5,640.00
Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	69.00	11,061.00	8,685.00	8,685.00	3,174.00	3,174.00	2,024.00	2,024.00	9,385.00	9,385.00	6,108.00	6,108.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	5,624.00	5,624.00	9,743.00	9,743.00	9,873.00	9,873.00	8,277.00	8,277.00
Intervention	Male	11.00	9,595.00	7,454.00	7,454.00	5,124.00	5,124.00	8,245.00	8,245.00	5,762.00	5,762.00	6,529.00	6,529.00
Intervention	Male	9,595.00	9,595.00	8,070.00	8,070.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	13,251.00	13,251.00	777.00	10,410.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	3,307.00	3,625.00	3,904.00	3,904.00	9,767.00	9,767.00	17,472.00	6,962.00	19,963.00	7,404.00	6,060.00	6,060.00
Intervention	Male	5,933.00	5,933.00	6.00	12,484.00	7,240.00	7,240.00	9,502.00	9,502.00	12,007.00	12,007.00	5,917.00	5,917.00
Intervention	Male	8,103.00	8,103.00	12,484.00	12,484.00	11,894.00	11,894.00	8,821.00	8,821.00	12,795.00	12,795.00	7,557.00	7,557.00
Intervention	Female	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	11,061.00	11,061.00	8,099.00	8,099.00	9,509.00	9,509.00	6,962.00	6,962.00	7,404.00	7,404.00	7,377.00	7,377.00
Intervention	Male	22.00	8,477.00	18,137.00	18,137.00	14,253.00	14,253.00	12,992.00	12,992.00	13,103.00	13,103.00	8,506.00	8,506.00
Intervention	Male	8,477.00	8,477.00	14,720.00	14,720.00	5,592.00	5,592.00	6,312.00	6,312.00	13,993.00	13,993.00	12,284.00	12,284.00
Intervention	Male	12,954.00	12,954.00	714.00	11,017.00	1,017.00	1,017.00	1,342.00	1,342.00	2,985.00	9,385.00	11,515.00	11,515.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	7,100.00	7,100.00	777.00	6,671.00	777.00	8,408.00	8,645.00	8,645.00
Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Control	Male	9,021.00	9,021.00	7,636.00	7,636.00	4,154.00	4,154.00	6,559.00	6,559.00	2,969.00	2,969.00	6,108.00	6,108.00
Control	Male	11,757.00	11,757.00	10,800.00	10,800.00	9,733.00	9,733.00	5,973.00	5,973.00	13,476.00	13,476.00	8,648.00	8,648.00
Control	Male	9,398.00	9,398.00	9,848.00	9,848.00	18,378.00	6,781.00	9,409.00	9,409.00	13,898.00	13,898.00	13,438.00	13,438.00
Control	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
Intervention	Male	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00